

A REVISION OF THE GENUS *PTERNANDRA* (MELASTOMATACEAE)

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ABSTRACT

Pternandra (Melastomataceae) is revised; the genus *Kibessia* is reduced to synonymy, as it differs only in one structural detail (the calyptrate calyx). Fifteen species and two varieties are recognized in this revision, of which two species (*P. angustifolia* and *P. crassicalyx*) are new. Two taxa are retained at the rank of variety for the first time (*P. azurea* var. *cordata* (Korth.) Maxwell, and *P. galeata* var. *elmeri* (Merr.) Maxwell). Thirteen previously described taxa of *Pternandra* and *Kibessia* are here reduced to synonymy. Descriptions, morphological discussion, key to taxa, illustrations of some taxonomically important features, and photographs of some type specimens have been included.

INTRODUCTION

Revived interest in the Malaysian flora and the Flora Malesiana project subsequent to the end of World War II has greatly increased both the quantity and quality of herbarium specimens available for research. This has certainly been true for *Pternandra* (including *Kibessia*), and both prompted and facilitated the completion of this revision. Nonetheless, the present paper is not really an attempted definitive treatment. The Philippine and New Guinean materials are still not satisfactory and work remains to be done in collecting as well as interpreting these plants in the eastern part of the Malay Archipelago. However, it is hoped that this paper will resolve some of the taxonomic confusion that has plagued both foresters and botanists working with *Pternandra* since the time of William Jack (1820). Comments on, additions to, and critiques of this revision will be greatly welcomed by the author.

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HISTORY OF THE GENUS *PTERNANDRA*

Pternandra (Greek *pterna* = heel; *aner, andros* = 'man') was established by Jack in 1822 with the type species *P. coerulescens*. The generic name refers to the heel-like extension of the anther connective. Jack's type material originated from Penang. In 1828, De Candolle described *Kibessia* on the basis of *Melastoma azurea* Bl. *Kibessia* is distinguished by the presence of a calyx cap and setose, often branched, bristles on the calyx tube and cap. *Ewyckia* was described by Blume in 1831, with *E. cyanea* as type species. This was listed immediately after *Kibessia* and differs in having a truncate calyx which is obscurely 4-lobed, and a much smoother tessellate calyx pattern. Apparently Blume was unaware of Jack's publication since *P. coerulescens* and *E. cyanea* are essentially the same (there is no calyx cap and the calyx pattern is tessellate).

In 1849 Blume established two more genera which are considered to be synonyms of *Pternandra*. The first, *Rectomitra*, based on *Eywickia galeata* Korth., differs from *Eywickia* in having a calyx cap which splits into several lobes and a verrucose to tuberculate calyx pattern. Blume obviously considered the ornamentation of the calyx tube more important than the cap in his generic distinctions, otherwise he would have placed *E. galeata* in *Kibessia*. The second, *Macroplacis*, based on *Kibessia cordata* Korth., was distinguished on the basis of vegetative characters from *Kibessia*; the floral features of this species and of *K. azurea* (Bl.) DC. are the same.

Naudin (1852) reduced *Pternandra* to *Eywickia*, but maintained *Kibessia*, *Rectomitra*, and *Macroplacis* as distinct genera. The last genus to be described on the basis of a *Pternandra* specimen was *Apteuxis* Griff. (1854), based on a Burmese plant which Griffith named *A. trinervis*. Miquel (1855) considered *Pternandra* and *Rectomitra* as synonyms of *Eywickia*, but maintained *Kibessia* and *Macroplacis*. Bentham and Hooker (1865) recognized *Pternandra* and reduced *Rectomitra* and *Macroplacis* to synonyms of *Kibessia*.

Triana (1871) maintained *Pternandra*, *Kibessia*, and *Rectomitra*, but combined *Eywickia* with *Pternandra* and *Macroplacis* with *Kibessia*. The bases for his generic distinctions were thus: *Pternandra* – no calyx cap; *Kibessia* – calyx cap falling off as a unit; *Rectomitra* – calyx cap splitting into several lobes. Kurz (1877) accepted *Pternandra* and listed only *P. coerulescens* Jack and *P. capitellata* Jack for his account of the Burmese forest flora. C. B. Clarke (1879) recognized both *Pternandra* and *Kibessia* in his account of the Melastomataceae in the Flora of British India, including three species of *Pternandra* (all from the Indian subcontinent) and four species of *Kibessia* (all from the Malay Peninsula). Of the latter, two are now regarded as synonyms of *P. coerulescens*. *Kibessia simplex*, as described by Clarke, is not Korthals' species but is *P. echinata* Jack; *K. pubescens* Decne. and *K. acuminata* Decne. are also now regarded as *P. echinata*; and *K. tuberculata* (Korth.) Hk. f. ex Cl. is a distinct species now called *P. tuberculata* (Korth.) Nayar (1978). Thus, in Clarke's treatment only three species of *Pternandra* continue to be recognized, and only *P. coerulescens* Jack is found in India. Clarke correctly reduced Griffith's *Apteuxis trinervis* to *Pternandra coerulescens*. Clarke distinguished *Pternandra* from *Kibessia* by its lack of a calyx cap, small cymes, and smooth calyx pattern. Clarke's treatment does not include any taxa of *Eywickia*, *Rectomitra*, or *Macroplacis*, so no information on the status or relationships of those taxa is present either.

Baillon (1890) was the first botanist to combine *Kibessia* and *Pternandra*, but Cogniaux (1891), in his monograph of Melastomataceae, continued to distinguish these two genera, although he combined *Rectomitra* with *Kibessia*. Cogniaux divided *Kibessia* into three sections, based on *Kibessia sensu stricto* (*Eukibessia* Cogn.), *Rectomitra* (as Sect. *Rectomitra* (Bl.) Cogn.), and *Macroplacis* (as Sect. *Macroplacis* (Bl.) Cogn.). Krasser (1893), in a treatment based on Cogniaux, kept both *Kibessia* and *Pternandra*.

In King's (1900) treatment of the Malayan Melastomataceae, three species of *Pternandra* (*P. coeruleascens*, with three varieties; *P. echinata*, and *P. griffithii* King) were recognized. Merrill (1921) enumerated four Bornean species of *Pternandra* and twelve Bornean species of *Kibessia*; among these sixteen species twelve are maintained in the present account as distinct taxa.

In Ridley's (1922) *Flora of the Malay Peninsula* six species of *Pternandra* were recorded, one of which (*P. galeata* (Korth.) Ridl.) had been included in *Kibessia* by Cogniaux. Mansfield (1925) kept *Kibessia* and *Pternandra* as distinct genera in his list of three taxa found in New Guinea. Burkill (1935), in his recombination of *Kibessia azurea* Bl. to *Pternandra azurea* (Bl.) Burk., also noted that *Kibessia* DC. should be reduced to a synonym of *Pternandra* Jack.

In the latest work on Malesian Melastomataceae, Bakhuizen v. d. Brink (1943, 1943–5) also maintained both *Pternandra* and *Kibessia* on the traditional basis. He discusses nine species and two varieties of *Kibessia*, and one species and two varieties of *Pternandra*. Of these, seven species are now still regarded as distinct. The varieties in *Kibessia* are not now kept; neither are the varieties in *Pternandra*.

Corner (1952) in his book *Wayside Trees of Malaya* lists *Pternandra* only, including 3 species.

Backer and Bakhuizen v. d. Brink (1963) in the *Flora of Java* list one species, *P. azurea* (Bl.) Burk., and indicate in a footnote that they consider *Kibessia* as a synonym of *Pternandra*.

Nayar (1978) transferred 18 taxa of *Kibessia* to *Pternandra*. Unfortunately, the overall value of the publication is dubious since most of the nomenclatural changes were made without any discussion. Of Nayar's new combinations only seven are herein considered as denominating distinct taxa, including *Pternandra cogniauxii* Nayar, a new name for *Kibessia korthalsiana* Cogniaux. Nine other recombined names are herein reduced to synonyms. *Pternandra ledermannii* (Mansf.) Nayar is a dubious species with close affinities to *P. rostrata* (Cogn.) Nayar. In my research studies at Leiden, Kew, and the British Museum, I did not notice any of Nayar's annotation labels on the relevant specimens of *Pternandra*. Nayar proposed a new species, *Pternandra moluccana* which, however, is based on a specimen in poor condition, that is unquestionably a species of *Medinilla*. This specimen, at Leiden, does not have a calyx calyptra or 8 equal stamens without appendages, as specified in Nayar's description. *Pternandra moluccana* thus will become a synonym under *Medinilla* when revisional work on that genus is carried out. Finally it may be noted that *Pternandra 'birtella'* in Nayar's paper should be *P. hirtella* (Cogn.) Nayar.

GENERIC CIRCUMSCRIPTION OF *PTERNANDRA*

Since there is but one real structural difference which can be used to separate *Kibessia* from *Pternandra*, that is the presence of a calyptra or calyx cap in the former

and its absence in the latter, an assessment of the importance of this character is required and will determine the taxonomic result. In my opinion, this is not a feature that merits generic distinction, nor should genera be separated on any single, isolated feature. In the present treatment, therefore, *Kibessia* is submerged in *Pternandra*, the latter name, being the oldest, thus being the correct name for this genus.

CONSTITUTION OF THE GENUS *PTERNANDRA*.

In this paper 15 species (with 2 varieties) of *Pternandra* are described, of which two are newly proposed (*P. angustifolia* Maxw. and *P. crassicalyx* Maxw., both from Borneo). Thirteen names are reduced to synonymy, four herbarium (*in scheda*) names are devalued, and one species attributed to *Kibessia*, and four species originally placed in *Pternandra*, are removed to other genera. Three taxa (species) remain dubious, and a fourth could not be evaluated herein because of unavailability of material for study.

TAXONOMIC TREATMENT

Pternandra Jack

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Rectomitra Blume, l.c. (1849) 6. Naudin, l.c. 261. Triana, l.c. 23, 153.

Macroplicis Blume, l.c. (1849) 7. Naudin, l.c. 260. Miquel, l.c. 569.

Apteuxis Griffith, Notul. 4 (1854) 672.

Trees to 25 m tall, diameter to 75 cm, less frequently shrubs. Upper branches cylindrical, angled, or winged; glabrous or pilose. Leaves opposite; blades chartaceous to coriaceous, simple, entire, lanceolate to suborbicular, acute to acuminate, at base narrowed, rounded, or cordate, 3–5-nerved from base, nerves sunken above, raised and tapering below, intramarginal nerve thin, often merging with margin in apical part of blade; petiole usually flattened; interpetiolar line or ridge distinct; stipules none. Inflorescence umbellate, cymose, paniculate, or nearly sessile and glomerulate, few to many-flowered, from leafless or leafy nodes or terminal. Calyx tube campanulate, with an external pattern (tessellate, umbonate, verrucose, or echinate plates, or setose appendages which are barbed to branched); margin truncate and minutely 4-cusped, or with a distinct calyx cap with or without tubercles or setae, which either falls off as one piece or splits into 2–4 lobes. Petals 4, imbricate to the right, usually broad-ovate to suborbicular, acute, at base truncate, thick or thin, glabrous. Stamens 8, equal, glabrous, with flattened filaments and dolabriform to oblong, laterally flattened anthers with antrorse aestivation, the connective thickened, straight, eglandular, usually with a minute spur near the filament. Stigma subcapitate to cylindrical, 4-grooved or -lobed; style slender; ovary 4-locular, placentation parietal, ovules numerous. Fruit a berry, campanulate-truncate, urceolate, or globose; the exocarp tessellate or echinate. Seeds numerous, flattened, quadrangular-rhombic, glossy tan or light brown.

Type species: *Pternandra coerulescens* Jack

From other genera of Melastomataceae, this genus is distinguished by its woody habit, tessellate to echinate calyx tube, calyptra or calyx cap in most species, small and only minutely appendaged anthers, 4-locular ovary, and many-seeded fruit. The characteristic leaf venation pattern (3–5 basal nerves) is usually a good field character, but confusion on this basis with other plants such as *Rhodamnia* (Myrtaceae), *Cinnamomum* (Lauraceae), and *Strychnos* (Loganiaceae), or with *Memecylon* of the same family, is possible. *Strychnos*, however, is a genus of which the species are mostly woody climbers.

MORPHOLOGY

Habit. — Of the 17 taxa discussed herein, there are nine which consist exclusively of trees, the remainder are either trees or shrubs. Species which are constantly or noticeably arboreal are: *P. coriacea*, *P. galeata*, *P. hirtella*, *P. tuberculata*. I have seen four taxa in the field (*P. coerulescens*, *P. echinata*, *P. galeata*, and *P. tuberculata*), but data on the other taxa has been gleaned from herbarium label notes. All taxa are interrestrial but one species, *P. cogniauxii*, has apparently the capacity to grow as an epiphyte, as noted on two specimens. *P. echinata*, though usually recorded as a tree, has twice been recorded as a climber; however in Singapore I have seen this only in tree form. Certain taxa, as follows, attain a considerable height and trunk diameter: *P. azurea* may reach 30 m and 75 cm; *P. galeata* var. *elmeri*, 20 m and 45 cm; and *P. tuberculata*, 20 m and 50 cm. Buttresses are common in larger individuals and the bole is usually straight with a wide crown.

Bark and wood. — Typically the outer bark is thin (0.25 – 1 mm) with longitudinal fissures or cracks, is smooth, and peels off in narrow strips. In colour it ranges from grey-brown to blackish, often mottled with various dark shades. The inner bark is 0.5 – 2 mm thick, variable in pigmentation, white, reddish-brown, greenish-yellow, or dark red. The wood is hard and usually yellowish or brownish. Browne ((**Forest Trees of Sarawak and Brunei**, 1955) gives some useful information on the general features and wood anatomy.

Branchlets. — These are useful in identification, especially vegetative material; they are either terete or flattened and grooved on two faces, or quadrangular below the upper

node and tapering to a terete condition, or quadrangular entirely, or even 4-winged, with membranous undulate wings on the angles. Older branchlets and branches of all taxa are terete and ungrooved, and without angles or wings.

The following taxa have entirely terete, cylindric internodes: *P. crassicalyx*, *P. galeata* var. *elmeri*, and *P. teysmanniana*.

Five taxa have branchlets which are usually flattened and grooved, or are somewhat quadrangular below the upper node: *P. cogniauxii*, *P. coriacea*, *P. galeata* var. *galeata*, *P. multiflora*, and *P. rostrata*.

Two taxa have quadrangular internodes: *P. echinata*, with the angles extending fully from one internode to the next, and *P. gracillis*, with the internode flattened and grooved on two faces below the upper node. In *P. hirtella*, the branchlets are basically quadrangular but the angles are slightly winged.

Two taxa have distinctly winged branchlets: *P. azurea* var. *cordata* and *P. tessellata*.

There are six taxa with pubescent branchlets (*P. azurea*, both var. *azurea* and var. *cordata*, *P. crassicalyx*, *P. echinata*, *P. hirtella*, and *P. tessellata*). All other taxa have glabrous branchlets. *P. echinata* can be distinguished from all other taxa solely on the basis of its 4-angled and pubescent branchlets.

The branchlet epidermis is thin, smooth, brownish or blackish, and may peel off (e.g. *P. coerulescens*, *P. multiflora*) leaving a smooth, tan undersurface. The wings of the branchlets in those taxa with this feature are fragile and may break off on the lower older part of the stems, leaving an interrupted series of irregular ridges, all of which however eventually fall off, leaving smooth, cylindric, glabrous internodes. The upper internodes are usually flattened, but fill out to cylindric form in age. Articulation zones at the base of the petiole tend to coalesce and may be mistaken for stipular scars. Branch tips with very young leaves show this feature clearly. The second node usually has a distinct interpetiolar ridge or line.

Leaves. — Usually these are simple, entire, glabrous or finely puberulent, 3–5-nerved (except *P. angustifolia*, 1-nerved) and may be chartaceous to coriaceous in texture. There is always a pair of intramarginal nerves. Secondary venation is pinnate in plan from each main nerve and is visible except in a few cases (the taxa with thickened leaf blades, e.g. *P. coerulescens* and *P. galeata* var. *elmeri*). In shape the blades range from lanceolate to suborbicular; the apex from rounded to acute, and the base from acute to cordate. The petiole is usually flattened; it is glabrous except in those five taxa which have pubescent branchlets.

Some taxa are recognizable from their leaves: *P. cogniauxii*, with 5 main nerves and a cordate base; *P. coriacea*, with small, coriaceous blades; *P. teysmanniana*, with blades glaucous beneath; etc. The leaves of *P. echinata*, *P. azurea* var. *azurea*, and *P. azurea* var. *cordata* are very similar. Also those of *P. galeata*, *P. coerulescens*; and *P. rostrata*, *P. tuberculata*; and *P. crassicalyx* and *P. hirtella* are similar.

Inflorescences. — *P. coerulescens* has a wide range of structural variation in the inflorescence, but most other taxa have definite inflorescence forms. That of *P. multiflora* is distinct in having the largest, most complex panicle (to 5 ramifications). Some specimens of *P. coerulescens* may have inflorescences branched to the 4th degree, but

most are less branched. Shortening of the ultimate axes result in a cyme-like or umbelliform appearance in some specimens of *P. tessellata* and *P. coerulescens*. In most taxa the inflorescences are cymose and 3- or 1-flowered. Solitary flowers occur in *P. azurea*, *P. hirtella*, and *P. rostrata*. In *P. echinata* such a transition may be seen, with the cymes ranging from 9- to 3-flowered, or even 1-flowered. Some species have the inflorescence condensed glomerulate, with few or solitary flowers, e.g. *P. angustifolia*, *P. cogniauxii*, *P. galeata*, and *P. gracilis*.

Most species possess axillary inflorescences from leafy nodes, but in *P. cogniauxii*, *P. galeata* var. *elmeri*, and *P. multiflora*, the nodes are leafless and thus the inflorescences are ramuline. In *P. coriacea* the inflorescence axes are flattened and grooved, in *P. rostrata* also but quadrangular, and in *P. azurea*, *P. echinata*, and *P. multiflora* they are clearly quadrangular. All axes are glabrous except in the five taxa with pubescent branchlets. The bracteoles and bracts are paired, connate, sheathing, and usually persistent. Only those of *P. echinata* are manifest or variable enough to be of taxonomic importance.

Calyx. — In both flowering and fruiting material the calyx provides the most distinct differences between the taxa. The structure of the calyx tube and the nature of the calyx margin has allowed the taxonomic discrimination or, in contrast, the synonymous status, of most of the taxa herein treated.

In *P. galeata* the calyx is urceolate and in the same species the variety *elmeri* is campanulate. It may be ornamented externally with a distinctive pattern of 4-angled flat or umbonate scales (tessellate pattern); or conical tubercles (tuberculate pattern); or with flattened or cylindrical appendages (echinate pattern) which may be entire or branched and glabrous or pubescent. *P. coerulescens* always shows the tessellate pattern; this also appears, sometimes, in *P. galeata*, which however can be distinguished by the urceolate form of the calyx. The umbonate-tessellate pattern occurs in *P. crassicalyx* and *P. tessellata*, while a more extreme form (conical-tuberculate) is common in e.g. *P. cogniauxii*, *P. rostrata*, and *P. tuberculata*. In *P. coriacea* and *P. teysmanniana*, for example, the pattern nearer the pedicel is umbonate-tuberculate but the gradual elongation of the umbos in the more distal scales reaches, at the margin, results in an echinate pattern. A more distinctly echinate pattern, with appendages longer than wide, is common to many taxa, though the shape of the appendage varies from setiform, as in *P. azurea* and *P. hirtella* (setae often branched) to flattened in *P. angustifolia* and *P. echinata* (appendages entire). In *P. azurea* var. *cordata* the appendages are both flattened and branched.

The calyx margin is truncate, completely in *P. coerulescens* and *P. multiflora*. The remaining 15 taxa have a calyx cap, or at least minute calyx lobes. Five taxa have a smooth calyx cap which ultimately splits into 2, 3, or 4 persistent lobes: *P. cogniauxii*, *P. galeata*, both varieties, *P. teysmanniana*, and *P. tuberculata*. The remaining taxa have a smooth calyx cap (*P. crassicalyx* and *P. rostrata*) or one with appendages near the middle (*P. azurea*, *P. hirtella*) which falls off as a unit at the time of petal expansion. Thus the mature flowers of these taxa appear to have a truncate (i.e. lobeless) calyx. Examination of buds is necessary to determine the difference, a crucial matter e.g. in distinguishing *P. multiflora* from *P. coerulescens*. In *P. tuberculata* the calyx is 4-lobed, a characteristic feature, and in *P. rostrata* the calyx is calyptrate, thus enabling distinction of these quite similar species.

Internally the calyx shows 8 lines and 8 grooves corresponding in which the anthers lie in the bud state. These correspond with the extraovarial chambers found in some other genera of this family, i.e. those of the tribes *Dissochaeteeae* and *Oxysporeae*.

Corolla. — The four petals are equal, symmetrical, usually broad-ovate to sub-orbicular, acute, and truncate at the base. They are usually thin with visible veins (*P. gracilis*) or thicker with indistinct or invisible veins (e.g. *P. coerulescens*). As taxonomic features the petals are not especially useful and are often lacking in herbarium specimens.

Stamens. — These are 8, glabrous, equal, with smooth, flat filaments in all taxa of *Pternandra*. In contrast to most other genera of Melastomataceae, *Pternandra* has very reduced and unspecialized anthers, similar in many ways to those of *Astronia* and (some) *Memecylon*. The anthers are usually dolabriform, i.e. axe-shaped, or oblong, bilocular (each opening by a longitudinal slit), and with a thickened, non-glandular connective which often bears a spur near the filament. The stamens appear to be rather uniform in the genus and are not very important in taxonomy.

Gynoecium and fruit. — The ovary is inferior, 4-locular; the style slender, glabrous, and the stigma subcapitate to cylindrical, at first 4-grooved and twisted, later 4-lobed. The placentation is parietal, with numerous ovules (Fig. 1). The fruit is a berry, which tends to retain its younger shape with a thickened, gritty pericarp and contains many flattened, quadrangular-rhombic or cuneate seeds. In *P. galeata* the fruit (unlike the floral calyx) is urceolate, but in all other taxa the fruit shape is pretty uniform. Seed morphology, however, may play a promising taxonomic role and should be investigated more thoroughly.

DISTRIBUTION

P. coerulescens and *P. echinata* var. *pubescens* (Decne.) King occur in Thailand, the former known from Chang Island in Trat Province, the latter (which is indistinguishable from var. *echinata*) from throughout the southern peninsular part of Thailand. In the Malay Peninsula and Singapore, four taxa occur: *P. coerulescens*, *P. galeata*, *P. tuberculata*, and *P. echinata*—the latter is apparently restricted to the Malay Peninsula and the Riouw Archipelago. Ten taxa appear to be endemic to Borneo: *P. cogniauxii*, *P. gracilis*, *P. galeata* var. *elmeri*, *P. teysmanniana*, are uncommon; *P. azurea* var. *cordata*, and *P. rostrata* are common in Borneo, but also occur in Sumatra and Java, the latter also in New Guinea. *P. coerulescens*, *P. galeata* s.s., and *P. tuberculata* range from W. Malaysia to New Guinea. Much more collecting must be done in Sumatra, Celebes, Moluccas, and New Guinea to determine more precisely the taxa of *Pternandra* which they include.

In terms of relative abundance I have adopted five crude but suggestive categories:

RARE:	<i>P. angustifolia</i> , <i>P. coriacea</i> , <i>P. galeata</i> var. <i>elmeri</i> , <i>P. tessellata</i> , <i>P. teysmanniana</i>
NOT COMMON:	<i>P. azurea</i> var. <i>cordata</i> , <i>P. cogniauxii</i> , <i>P. crassicalyx</i> , <i>P. gracilis</i> , <i>P.</i> <i>hirtella</i> , <i>P. multiflora</i>
COMMON:	<i>P. azurea</i> var. <i>azurea</i> , <i>P. galeata</i> var. <i>galeata</i> , <i>P. tuberculata</i>
VERY COMMON:	<i>P. echinata</i> , <i>P. rostrata</i>
MOST COMMON:	<i>P. coerulescens</i> .

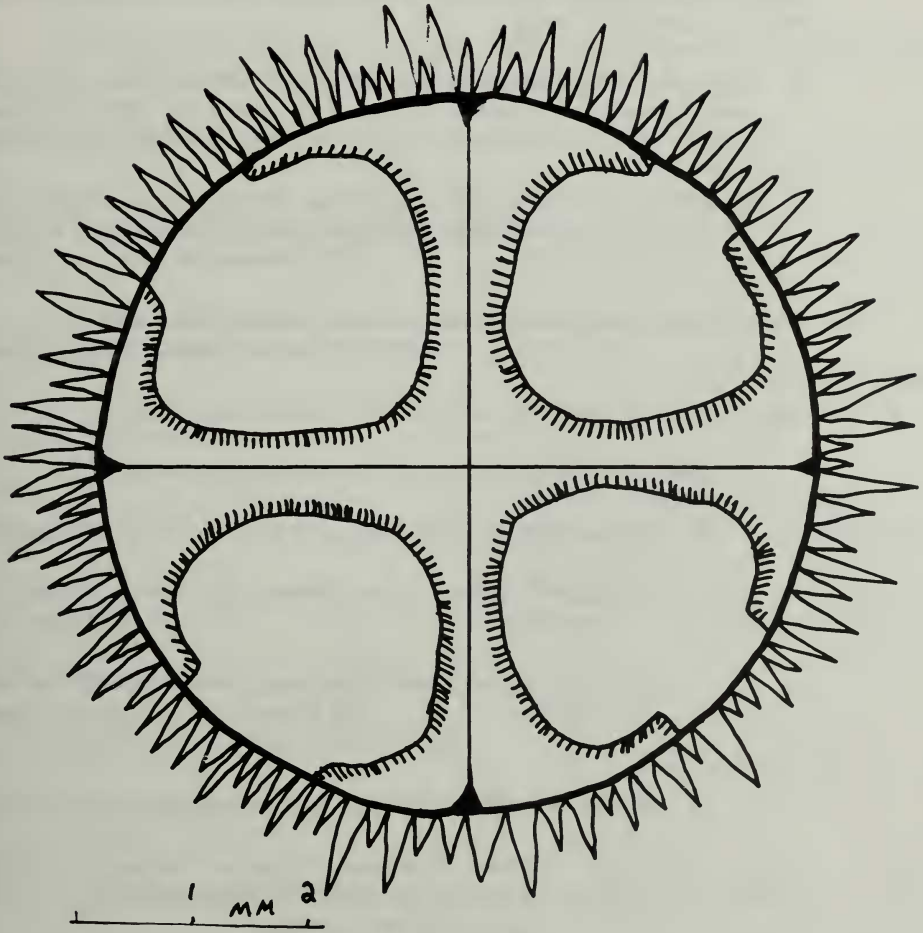


Fig. 1. *Pternandra echinata* Jack ovary, x-section, showing parietal placentae and ovules. Drawn from Maxwell 76-757.

KEY TO THE TAXA OF *PTERNANDRA*

1. Calyx tube with setose to echinate scales which are distinctly longer than wide.
 2. Scales branched near the tip, especially those near the calyx margin; calyx cap or lobes tuberculate to echinate near middle.
 3. Blades mostly narrowed or sometimes rounded, never cordate, at base; petiole at least 3 mm long.
 4. Branchlets and blades beneath densely red-brown pilose, the pubescence persistent; blades 9–17 cm long, 4.5–8 cm wide, coriaceous (12) *P. hirtella* (Cogn.) Nayar
 4. Branchlets glabrous at maturity; nerves minutely pilose beneath near petiole, glabrescent; blades generally thinner, smaller than as above (2) *P. azurea* (Bl.) Burk. var. *azurea*
 3. Blades rounded and usually cordate at base; petiole up to 2 mm long (3) *P. azurea* var. *cordata* (Korth.) Maxw.
 2. All scales entire; calyx cap with or without tubercles or appendages.
 5. Blades with 3 main nerves and 2 intramarginal nerves.
 6. Blades beneath, branchlets, and inflorescence axes pubescent.
 7. Scales flattened, never barbed; cap without tubercles or appendages. (8) *P. echinata* Jack
 7. Scales setose, the upper ones often barbed; cap with tubercles. (2) *P. azurea* (Bl.) Burk. var. *azurea*.
 6. Blades beneath, branchlets, and inflorescence axes glabrous.
 8. Blades coriaceous, glaucous beneath, generally drying grey to whitish; inflorescence axes 1–1.5 cm long; cap without tubercles. (6) *P. coriacea* (Cogn.) Nayar
 8. Blades chartaceous, green beneath; inflorescence axes less than 5 mm long; cap with setose to echinate appendages. (11) *P. gracilis* (Cogn.) Nayar
 5. Blades with 1 main nerve and 2 intramarginal nerves. (1) *P. angustifolia* Maxw.
1. Calyx scales tessellate, umbonate, verrucose, tuberculate; usually wider than long.
 9. Scales tessellate or slightly umbonate near the margin.

10. Blades cordate at base, 5-nerved, 13–26 cm long, 7–13 cm wide; inflorescence mostly from behind the leaves (4) *P. cogniauxii* Nayar
10. Blades narrowed or rounded at base, 3-nerved; inflorescence mostly from leafy nodes; blades usually smaller than as above.
11. Calyx cap or lobes distinct; fruit urceolate or campanulate
12. Calyx tube and cap c. 0.25 mm thick, cap splitting into 4 persistent lobes; fruit urceolate, the pericarp to 0.5 mm thick.
13. Blades subcoriaceous to coriaceous; calyx tessellate
 (9) *P. galeata* (Korth.) Ridl. s. s.
13. Blades thick coriaceous; calyx umbonate to tuberculate
 (10) *P. galeata* var. *elmeri* (Merr.) Maxw.
12. Calyx tube and cap c. 1.5 mm thick, cap falling off in one piece; fruit campanulate truncate, pericarp c. 1.5 mm thick.
 (7) *P. crassicalyx* Maxw.
11. Calyx cap not developed; fruit globose.
14. Inflorescence 7–75 mm long; petals white, blue, or purple
 (5) *P. coerulescens* Jack
14. Inflorescence 15–30 cm; petals yellow
 (13) *P. multiflora* Cogn.
9. Scales umbonate, verrucose, or tuberculate near the margin.
15. Branchlets distinctly sinuate-winged
 (15) *P. tessellata* (Stapf) Nayar
15. Branchlets cylindrical.
16. Blades subcoriaceous to coriaceous; cap smooth or tuberculate.
17. Blades broadly rounded to cordate at base, 5-nerved; inflorescences mostly from behind the leaves; cap tessellate to tuberculate
 (4) *P. cogniauxii* Nayar
17. Blades narrowed to rounded at base, 3-nerved; inflorescences mostly from leafy nodes; cap smooth.
18. Inflorescence glomerulate, primary axes c. 1 mm long; pedicels 1–2 mm long; calyx tube 3–4 mm long; petals thin; fruit urceolate; leaf blades to 5 x 3 cm, petiole 1.5–2.5 mm long.
 (16) *P. teysmanniana* (Cogn.) Nayar

18. Inflorescence umbellate, cymose, or of solitary flowers; primary axes and pedicels generally over 2 mm long; calyx tube 4–6 mm long; petals thick; fruit campanulate, truncate; blades at least 6.5 cm long, 3 cm wide; petiole 2–8 mm long.
19. Cap splitting into 4 lobes; primary and secondary inflorescence axes puberulous
 (17) *P. tuberculata* (Korth.) Nayar
19. Cap falling off in one piece; primary and secondary axes glabrous.
20. Inflorescence axes 1.5–2 mm thick; mature calyx 6 mm long, 5 mm wide; leaf blades 6.5–21 cm long, 3–10 cm wide, drying light or dark brown
 .. beneath (14) *P. rostrata* (Cogn.) Nayar
20. Inflorescence axes to 1 mm thick; mature calyx 4.5 x 4 mm; blades 4.5–6.5 cm long, 2.5–4 cm wide, usually drying greenish to yellowish beneath
 (6) *P. coriacea* (Cogn.) Nayar
16. Blades chartaceous.
21. Cap tuberculate; blades drying brownish or olive-green; inflorescence axes glabrous. (11) *P. gracilis* (Cogn.) Nayar
21. Cap smooth; blades drying blackish to brown; inflorescence axes pilose
 (17) *P. tuberculata* (Korth.) Nayar

LIST OF TAXA IN *PTERNANDRA*

1. *P. angustifolia* Maxw. — Sarawak, endemic.
2. *P. azurea* (Bl.) Burk. var. *azurea*. — Lingga Archipelago, Sumatra, Java, Borneo.
3. *P. azurea* var. *cordata* (Korth.) Maxw. — Borneo, Sumatra.
4. *P. cogniauxii* Nayar — Borneo, endemic.
5. *P. coerulescens* Jack — Thailand, W. Malaysia, Riouw Archipelago, Borneo, Celebes, Moluccas, New Guinea, Lingga, Archipelago, Torres Strait.
6. *P. coriacea* (Cogn.) Nayar — Borneo, endemic.
7. *P. crassicalyx* Maxw. — Sarawak, endemic.
8. *P. echinata* Jack — Thailand, W. Malaysia and Singapore, Borneo.
9. *P. galeata* (Korth.) Ridl. var. *galeata*. W. Malaysia, Sumatra, Borneo, New Guinea.
10. *P. galeata* var. *elmeri* (Merr.) Maxw. — Borneo, endemic.
11. *P. gracillis* (Cogn.) Nayar — Borneo, endemic.
12. *P. hirtella* (Cogn.) Nayar — Sarawak, endemic.
13. *P. multiflora* Cogn. — Sabah and Sarawak, endemic.
14. *P. rostrata* (Cogn.) Nayar — Borneo and Sumatra; one collection from New Guinea.
15. *P. tessellata* (Stapf) Nayar — Borneo, endemic.
16. *P. teysmanniana* (Cogn.) Nayar — Kalimantan, endemic.
17. *P. tuberculata* (Korth.) Nayar — W. Malaysia, Riouw Archipelago, Sumatra, Borneo, New Guinea.

1. *Pternandra angustifolia* Maxw., *sp. nov.*

Rami cylindrici glabri, epidermide brunnescenti, deglubescenti; folia membranacea, glabra lanceolata acuminata, basi acuta, uninervia, nervis intramarginalibus tenuibus exceptis, lamina 55–75 mm longa, 12.5–20 mm lata, petiolis 1–2 mm longis. Inflore-

scientia solitaria, axillaris, reducta uniflora, glabra, axi primario c. 5 mm longo, nodis 2, pedicello c. 1 mm longo, calycis tubus echinatus glaber c. 4 mm longus; calyptra mammiformis laevis glabra tenuis apice acuminato, minutissime 2-4-dentato. Fructus ignotus.

Type: SARAWAK: Gunung Santubong, hillside, heath forest, alt. c. 200 m, Haron 21444 (L, holotype; isotypes in A, K, BO, KEP, MEL, and SING). Fig. 2.

Small tree. Upper branchlets cylindric, smooth, glabrous, c. 1 mm thick, epidermis drying brown and peeling off leaving a smooth, tan coloured surface on older branchlets and branches. Blades subcoriaceous, glabrous, lanceolate, acuminate at the tip (acumen 1–1.5 cm long), narrowed at the base; uninerved, midnerve sunken above, raised and tapering below; intramarginal nerves faint, 1–2 mm from the margin and merging with it in the upper part of the blade; secondary venation pinnate, c. 10–20 pairs, obscure above, obscure to invisible below; 5.5–7.5 cm long, 1.25–2 cm wide, drying grey-green above, brown below. Petioles 1–2 mm long, c. 1 mm thick, glabrous. Inflorescences of solitary flowers from leafy nodes, axes slightly flattened, glabrous. Bracts and bracteoles lanceolate, acute, c. 1 mm long, glabrous. Primary axes c. 5 mm long, with two nodes, c. 0.5 mm thick at the base, pedicels c. 1 mm long. Calyx tube campanulate, densely covered with glabrous, entire, echinate appendages with are shortest near the pedicel (c. 1 mm) and longest (c. 2 mm) near the margin, c. 4 mm long, 4 mm wide, pale green with a magenta hue near the base, drying brown; calyx cap mammiform, acute and 2–4 apiculate at the tip, smooth, thin, glabrous, 4–5 mm long, dehiscence unknown but probably splitting into several pieces. Bud petals imbricating to the right, broadly ovate, acute at the tip, truncate at the base, thickened with thinner margins, venation invisible, c. 3.5 x 3.5 mm. Filaments c. 1 mm long; anthers c. 2 mm long. Stigma in bud cylindric, 4-grooved, c. 1 mm long; style c. 5 mm long, glabrous. Fruit not seen.

Pternandra angustifolia Maxw. is readily distinguished from all other species of *Pternandra* by its small, narrow blades which have a prominent midrib and two faint intramarginal nerves. All other species of *Pternandra* have 3 or 5 nerves in addition to a pair of intramarginal ones. The echinate calyx tube and smooth cap strongly resemble *P. echinata* Jack, however the latter species is easily recognized by its thin, 3-nerved, pilose blades; large bracts, and pilose, angled branchlets.

I have chosen the epithet *angustifolia* so that the most obvious distinguishing feature of this species is indicated. *P. angustifolia* is in no way related to *Kibessia angustifolia* Bl. which is probably the same as *P. echinata* Jack (q.v.). Fortunately Nayar, in his relentless pursuit of botanical fame, overlooked a possible recombination of *K. angustifolia* to *Pternandra* in his recent uncritical paper (Bull. Bot. Surv. India 17 (1978) 51). Fortunately, this oversight is insignificant when one considers all the confusion that Nayar has created in his infuriating and inept meddlings in the Melastomataceae.

Fig. 2. A: calyx; B: bud petal; C: stamen.

Distribution:

Borneo

Sarawak – Gunung Santubong: Haron 21444 (holotype L, isotypes: K, SING, SAN, A, BO, KEP, MEL) on a hillside of a heath forest at an altitude of c. 200 m.



Fig. 2. *Pternandra angustifolia* Maxw. A-C: Haron 21444 (holotype).

2. ***Pternandra azurea*** (Bl.) Burk., Kew Bull. (1935) 319. *Melastoma azureum* Bl., Bijdr. Fl. Ned. Ind. 17 (1826) 1079. *Kibessia azurea* (Bl.) DC., Prodr. III (1828) 196; Cogniaux ex Winkler in Engl., Bot. Jahr. 48 (1912) 109; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 450; Bakhuizen f., "Thesis" (1943) 314, Med. Mus. Bot. Utrecht 91 (1943) 314, Rec. Trav. Bot. Neerl. 40 (1943-45) 314; Backer & Bakhuizen f., Fl. Java I (1963) 371. *Kibessia azurea* (Bl.) DC. var. *typica* Hochreutiner, Pl. Hochr. II (1925) 162; Heyne, De Nut. Pl. Ned. Ind. II (1927) 1205. *Kibessia azurea* Bl. var. *subalata* (Bl.) Miq., Fl. Ned. Ind. I (1855) 570; Bakh. f. l.c. (1943, 1943-45) 316, *syn. nov. Pternandra azurea* (Bl.) Burk. var. *subalata* (Bl.) Nayar, Bull. Bot. Surv. India 17 (1978) 52. *Kibessia subalata* Bl., Mus. Bot. Lugd.-Bat. I:I (1849) 8; Naudin, Ann. Sci. Nat. 3:18 (1852) 262; Triana, Trans. Linn. Soc. 28 (1871) 152 ("*subulata*"). *Kibessia simplex* Korth. in Temm., Verh. Nat. Gesch. (1844) Bot. 253, Bakh. f., l.c. (1943, 1943-45) 317, *syn. nov. Pternandra simplex* (Korth.) Baill., Hist. Pl. 7 (1880) 24, *pro comb. non fig. 37 et 38. Pternandra borneaensis* Nayar, l.c. 52, *nom. superfl. (nom. nov. for K. simplex Korth.)*. *Kibessia simplex* Korth. var. *oblonga* Bl., l.c. (1849) 9, *syn. nov. Kibessia acuminatissima* Merr., Univ. Calif. Publ. Bot. 15 (1929) 228, *syn. nov. Pternandra acuminatissima* (Merr.) Nayar, l.c. 53.

var. *azurea*.

Tree up to 30 m tall with a diameter up to 75 cm, often shrubby. Bark finely fissured, soft, c. 0.5 mm thick, flaking and peeling off in strips 1-3 cm wide, brown; inner bark brown to light yellowish, 2 mm thick; wood yellowish. Branchlets 4-angled, minutely puberulous, glabrescent, brown-blackish when dry, peeling and cracking with a sinuate-alate appearance, rapidly falling off leaving a cylindric, smooth branch drying grey-tan, 1-2 mm thick, nodes flattened. Blades chartaceous to subcoriaceous; lanceolate, elliptic, or ovate; acuminate at the tip (acumen up to 1.5 cm long), narrowed and slightly decurrent at the base; immature blades minutely puberulous, especially below, becoming glabrous, glabrous above; prominently 3-nerved from the base, nerves sunken above, prominently raised and tapering below, lateral nerves slightly thinner, minutely puberulous near the base below, glabrescent; intramarginal nerve faint, c. 1 mm from the margin; secondary venation pinnate from each of the 3 main nerves, c. 20-30 pairs from each, slightly raised below; 6.5-15 cm long, 3-6 cm wide, drying dark brown or olive-brown above, lighter brown below. Petioles flattened, 2-4 mm long, 1.5-2 mm wide, at first minutely puberulous, later glabrescent. Inflorescences from leafy nodes, frequently terminal; flowers solitary or in 3-flowered cymes; axes 4-angled, minutely puberulous, glabrescent, 10-30 mm long. Bracts lanceolate, acute, 1-1.5 mm long, minutely puberulous. Primary axes 5-20 mm long with 1 or 2 nodes, c. 1 mm thick; secondary axes not developed (solitary flowers) or up to 8 mm long; pedicels 3-6 mm long, slightly longer and thicker in fruit. Calyx tube campanulate, densely covered with minutely puberulous bristles, which are often curved or hooked, simple or branched, or with flattened, triangular, mostly barbed scales which are shorter near the pedicel and longer and usually more barbed near the margin; bristles and scales often mixed together, longest ones 4 mm long and 1 mm wide at the base; scales and bristles not or obscurely barbed in bud; margin truncate, thickened, at maturity 8-10 mm long, 8 mm wide, minutely puberulous throughout, glabrous with 16 internal lines; calyx cap conical, acute, c. 5 mm long, distinctly tuberculed or with slender, frequently curved, spines near the middle, minutely puberulous throughout, falling off as a unit, pale green. Petals slightly thickened, broadly ovate to suborbicular, obtuse to acute at the tip, broadly narrowed and truncate at the base, margins thinner, c. 5 mm long, 5 mm wide, glabrous, pale pink, blueish-pink, or dark blueish. Filaments flattened, c. 5 mm long; anthers c. 2 mm long. Stigma cylindric, at first 4-grooved, later 4-lobed, 2.5-3 mm long. Style slender, 6-8 mm long, glabrous.

Fruit campanulate, truncate, bristles and/or scales frequently slightly more developed, internal lines distinct, style often persisting; 8–10 mm long, 9–12 mm wide, minutely puberulous externally; areolus glabrous; exocarp green then pale yellow, turning red, and finally purplish when ripe; pericarp c. 1 mm thick, gritty. Seeds numerous, flattened, rhombic-rectangular, glossy tan-khaki, c. 0.75 mm long.

Vernacular: siri siri (Tawau District, Sabah), siren siren (Tambunan District, Sabah), polok (Iban); Java (Soend.): ipis koelit, ki boeroej, ki djambe, ki djeboeg.

Pternandra azurea (Bl.) Burk. var. *azurea* is easily distinguished from all other taxa of *Pternandra* by the usually barbed calyx scales and acute blade bases. *P. azurea* var. *cordata* (Korth.) Maxw. has more persistent, sinuate-alate wings on the branches and cordate blades; and *P. echinata* Jack has thinner, pilose blades and branches, entire calyx scales, and lacks tubercles on the calyx cap.

The two type specimens of *K. simplex* (Korthals s.n., from Borneo) at Leiden are, unfortunately, in poor condition with only one small bud remaining on one sheet, while the other collection is vegetative. Miquel, in his original description of this species, merely included a few words about the leaves and that the calyx has simple setae with a sub-nude cap. The bud specimen of the type collection is very immature and has simple bristles. The branches, blades, and inflorescences of this collection of *P. simplex* match those of the type specimens of *P. azurea*. In fact, I have not been able to distinguish the two species vegetatively. *P. azurea*, according to Blume, has branched bristles on the calyx and it is fortunate that the types of this species at Leiden are well preserved, since I have been able to get a good idea about these two species. Blume notes for *K. simplex* that the bristles are rarely branched. In addition to the numerous collections examined by Bakhuizen f. at Leiden plus the many other newer collections of this species at Leiden, I have been able to see that these two species are the same.

Included among the specimens of this species that I have studied, the bristles on calyx range from almost all being entire, entire below and branched near the margin, and nearly all branched. The appendages range from setose to linear and in a few collections the scales are flattened and triangular. There is also individual variation in the degree of branching and in many specimens this appears to be a factor related to the maturity of the flowers. Examples of some collections with almost entirely simple, setose appendages include: Nahar 12700 and Luang 22383 (both from Sarawak) and Cockburn & Saikeh 70033 (from Sabah). Some collections with branched bristles near the margin are: Kostermans 7039, and Nooteboom & Chai (from Borneo); the latter collection also has some calyx specimens that are all simple, thus there is variation in the nature of the bristles even on the same plant. Finally, some collections with flattened, branched scales include: Winkel 1415 (from Java), deVries 107 (from Sumatra); with Clemens 21565, and Luang 21874 (both from Sarawak).

Transitional situations are common where there are simple and branched scales, therefore there is nothing substantial that can be used to distinguish the two species on all herbarium sheets. The petals and anthers from the few collections with mature flowers that I have seen are the same, regardless of the nature of the calyx appendages. More evidence lies in the development of the calyx bud which always appears to have simple bristles when young. Maturity of the flowers also involves the development of the bristles or scales, with the fruit having the most distinct appendages. Two sheets, Clemens 29367 (Sabah), and Paie 28437 (Sarawak) have buds identical to the one on the type specimen of *K. simplex* and also include more mature buds with immature and mature fruit that

have distinctly branched, and a few flattened, appendages. These more mature flowers and fruits are identical to those on the type collections of *P. azurea*.

There is good reason to consider *K. simplex* as a synonym of *P. azurea* since not only is the former species poorly defined, but it is extremely difficult to distinguish from the latter. With the numerous variant intermediates, including Elmer 21310 (Sabah) — type of *K. acuminatissima* Merr. — which has fruits covered with simple bristles except near the margin where they are more flattened and branched; it is clear that *P. azurea* is variable in the calyx ornamentation and that this factor cannot be determined unless mature flowers and fruits are available.

King considered *Kibessia simplex* Korth. as a synonym of *P. echinata* Jack, however the two taxa are easily distinguished by the calyx appendages and the absence of spines on the cap of *P. echinata*.

Kibessia azurea (Bl.) DC. var. *subalata* (Bl.) Miq. is clearly the same as *P. azurea* and does not merit distinction as a separate taxon. The holotype of this variety (Korthals s.n., from Sumatra) does indeed have winged branches which appear sinuate-alate due to the peeling off of the epidermis. Beccari 688 (from Sumatra) shows all stages of peeling from a smooth, cracked, sinuate-alate, to completely lost epidermis. The branches with the epidermis lost are cylindrical and are identical to those branches on the type collections of *K. simplex* and *P. azurea*, plus most of the other collections of these two species at Singapore and Leiden which have already lost their epidermis.

The calyx bristles in these specimens with an intact or peeling epidermis are almost all entire (e.g. Lampangi 24078, Gibot 31294, and Brand 24547 (all from Borneo); to flattened and branched (e.g. the holotype of the variety), Beccari 688, and Paie 28331 (from Sarawak). This not only shows that var. *subalata* is based on an inconsistent characteristic, but also that these bristles are found on specimens that could be referred to both *K. simplex* and *K. azurea*.

Waitz s.n., from Gunong Rantau, Kalimantan, the holotype of *Kibessia simplex* Korth. var. *oblonga* Bl., has an abnormal inflorescence without flowers or fruits. From the branches and leaves I think that the specimen is more like *P. azurea* rather than *P. coerulescens* Jack as Bakhuizen f. indicates.

Nayar (1978), in an entirely cursory attempt to change as many taxa of *Kibessia* to *Pternandra* as possible, renamed *Kibessia simplex* Korth. as *Pternandra borneaensis* Nayar. Nayar obviously never examined any authentic material of *K. simplex* Korth. otherwise he might not have renamed this taxon since it is the same as *P. azurea* var. *azurea*. *Pternandra simplex* (Korth.) Baill., which Nayar assumed was a distinct taxon, is not based on *Kibessia simplex* Korth. Nayar of course, did not comment on *P. simplex* (Korth.) Baill. since this would have required more than a superficial attempt at taxonomic research which he apparently prefers to conscientiously avoid.

Baillon's (1880) illustrations of *Pternandra simplex* (Korth.) Baill. are certainly not based on *Kibessia simplex* Korth. since the diagrams show the calyx with a tessellate and smooth pattern, not bristly as in *P. azurea*. The figures (37 and 38) are referable to *P. rostrata* (Cogn.) Nayar, the most likely choice, or *P. tessellata* (Stapf) Nayar. The combination *Pternandra simplex* (Korth.) Baill. is a valid recombination, thus Nayar's *Pternandra borneaensis* Nayar is a superfluous name.

Distribution:

Lingga Archipelago

Pulau Lingga — Pasir Pandjang: Bunnemeyer 6900.

Sumatra

Asahan — Loemban Ria: Boeea 7985.

Benkoelen — de Voogd 1143; Mt. Singlang: Schiffner 2309.

Borneo. Sabah — Anap, Bukit Mersing: Sibat 21874, 22383; Bombari: Gibot 18595; Dallas: Clemens 29367, 30350; Merotai Besar: Gibot 31294, 31310; Mt. Kinabalu: Chew, Corner, Stainton 7; Sipitang, Ulu Moyah: Wood 16663; Tawao: Elmer 21310 (*Kibessia acuminatissima* Merr., isotype L); Ulu Sg. Kinabatangan: Gibot 32947; Ulu Sungei Serudong: Aban 31163; Tenom-Kamabong-Katabu Track: Cockburn & Saikeh 70033; Tambunan, Trusmadi For. Res.: Mikil 31450; Ulu Sungei Danum: Cockburn 85032.

Sarawak — Balleh, N. Sebatong, Ulu Mujong: Ashton 19923; Gat, upper Rejang River: Clemens 21565; Kakus, Ulu Mayeng: Sibat 21736; Kalabit Highlands: Nooteboom & Chai 02085; Kapit District, Bukit Raya: Soepadmo & Chai 28176; Sungei Membalua For. Res.: Price 257; Miri, Bakam Road: Au & Chai 24125; Mostyn: Sinanggul 57191; Mt. Murud: Nooteboom & Chai 01831; Semengoh For. Res.: Purseglove & Shah 4429 (galled); Serian, Sabal For. Res.: Nahar 12700; Sungei Balleh: Anderson & Paie 28331; Ulu Balleh: Paie 28437.

Kalimantan — Amai Ambil: Hallier 3113; Balikpapan (Gunong Beratus): Kostermans 7507; Gunong Rantau: Waitz sn (*Kibessia simplex* Korth. var. *oblonga* Bl., holotype L); Gunong Sahasi, Belajan River: Forman 428; Gunong Sakoembang: Korthals sn (*Kibessia simplex* Korth., holotype L); Gunong Singgalang: Korthals sn (*Kibessia azurea* Bl. var. *subalata* (Bl.) Miq., holotype L); W. Koetai, Kombeng: Endert 5192; Kutei: Kostermans 5535; near L. Petah: Endert 3195; near Mt. Kemul: Endert 3622; Mangapu, Singkulirang: Walsh 715; Mt. Kenepai: Hallier 1763; Nunukan Island: Kostermans 9043, Miejer 2252, Paymans 7; Tanjung Bangko: Kostermans 7039; exact location unknown: Winkler 2321.

Java — Djakarta, Batavia-Bantam: van Steenis 11193; Batavia, Gunong Paniisan: van Steenis 2328; Gunong Pangerango: Blume sn (*Kibessia azurea* Bl., holotype L); Leugkong District: Kostermans 23820; Mt. Salak: Hochreutiner 761 (*Kibessia azurea* Bl. var. *typica* Hochr., L); Palak: Danser 2481.

3. *Pternandra azurea* (Bl.) Burk. var. *cordata* (Korth.) Maxw., *stat. nov.* *Pternandra cordata* (Korth.) Baill., Hist. Pl. 7 (1880) 23. *Kibessia cordata* Korth. in Temm., Verh. Nat. Gesch. (1844) Bot. 253 and tab. 66; Blume, Mus. Bot. Lugd.-Bat. I: 1 (1849) 8; Naudin, Ann. Sci. Nat. 3: 18 (1852) 262; Miquel, Fl. Ned. Ind. I (1855) 570; Triana, Trans. Linn. Soc. 28 (1871) 152; Cogniaux in Boerlage, Handl. Fl. Ned. Ind. I (1890) 536; Cogniaux in DC., Monogr. Phan. 7 (1891) 1107; Krasser in Engler & Prantl, Die Nat. Pfl. Fam. 3: 7 (1893) 196 and tab. 81, D-G; van Steenis, Bull. Jard. Bot. Buitenz. 3: 13 (1) (1933) 47; Bakhuizen f., "Thesis" (1943) 316, Med. Mus. Bot. Utrecht 91 (1943) 316, Rec. Trav. Bot. Neerl. 40 (1943-45) 316. *Kibessia tetraptera* Miq. l.c. 571; Triana, l.c. 152; Cogniaux, l.c. (1890) 536 and l.c. (1891) 1107; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 451, Bakhuizen f., l.c. 316, *pro syn.*

Tree 2–10 m tall, diameter up to 12 cm, or a shrub; outer bark smooth, grey-brown, wood light yellow. Branchlets distinctly 4-angled and typically undulate winged, minutely puberulous, 1.5–2 mm thick; epidermis brown, peeling and flaking off leaving irregular and scattered remnants of the angles and wings; older branches without the epidermis, smooth, cylindrical, glabrous, drying greyish to khaki-tan. Blades chartaceous to subcoriaceous, lanceolate, elliptic, to ovate; acuminate at the tip (acumen 1–1.5 cm long), broadly rounded and shallowly (1–2 mm) cordate at the base; 3-nerved from the base, nerves sunken above, raised and tapering below; intramarginal nerves thin, c. 1 mm from the margin; secondary venation pinnate from each of the 3 main nerves, c. 30–40 pairs, slightly raised below; glabrous above, minutely puberulous on the nerves below; green above, pale green below; drying olive-green to dark brown above, lighter brown below; 7–12 cm long, 3–6 cm wide. Petioles c. 2 mm long, flattened, blades appearing sessile, minutely puberulous, c. 1.5 mm thick. Flowers solitary from leafy nodes or in a terminal 3-flowered umbel; axes 4-angled, minutely puberulous, c. 1 mm thick; bracts lanceolate, acute at the tip, c. 1.5 mm long, minutely puberulous; primary axes 5–8 mm long with usually 1 node, secondary axes not developed or up to 5 mm long, pedicels 5–8 mm long. Calyx tube campanulate, densely covered with setose to flattened bristles which are shorter and simple or barbed in the lower half, longest (2–3 mm) and branched near the margin, minutely puberulous; 6 mm long, 5 mm wide, green; calyx cap conical, acute, with 1 or several whorls of simple, barbed, or branched appendages, minutely puberulous, falling off in one piece, c. 5 mm long. Petals slightly thickened, broadly ovate to suborbicular, acute and often mucronate at the tip, broadly narrowed at the base, c. 7–8 mm long, 8–9 mm wide, purple or lilac. Filaments flattened, c. 2 mm long, yellow; anthers with a thickened bulge on the connective near the filament; stigma cylindrical, slightly twisted to the right, 4-grooved and later 4-lobed, c. 2 mm long, yellow. Style slender, c. 6 mm long. Fruits campanulate, truncate, scales persisting, c. 8 mm long, 10 mm wide; areolus glabrous, internal lines distinct; pericarp c. 1 mm thick, gritty. Seeds numerous, cuneate-quadrangular, flattened, c. 1 mm long, glossy khaki-tan.

In general, the distinction between var. *cordata* and var. *azurea* is distinct viz. the former has rounded to cordate blades, shorter petioles, and branchlets with more persistent epidermal remnants in a sinuate-alate form. Ultimately, however, the epidermis falls off leaving a smooth, greyish to khaki-tan surface common to both taxa.

As far as I can determine from the limited number of mature flowers available; the petals, anthers, stigma, and fruits of var. *cordata* are the same as those of var. *azurea*. There is less variation in the shape of the calyx appendages in var. *cordata* than in var. *azurea*, and in young buds of several specimens of var. *cordata* (e.g. Boeea 9363, de Wilde & de Wilde-Duyfjes 12829 (both from Sumatra), and Korthals s.n. (from Java)) are indistinguishable from those on the type collections of *K. simplex* and *P. azurea*. The branching of the scales occurs with the development of the flowers, and after flowering and with mature fruit these appendages are readily observed.

There are some specimens, e.g. Reinwardt s.n., and Bunnemeyer 3443 (both from Sumatra) that have some blades rounded or slightly cordate at the base and others that are narrowed. Bakhuizen f. identified both of these collections as *K. cordata*, however a distinction between the two taxa here is difficult to determine. The petioles in both specimens are short, thus I tend to agree with Bakhuizen f. in his identifications.

Var. *cordata* is structurally very close to *P. hirtella* (Cogn.) Nayar which has acute blade bases, cylindrical to somewhat angled (not winged) branches, and is covered with a reddish-brown tomentum. Vegetatively var. *cordata* is very similar to *P. tessellata* (Stapf)

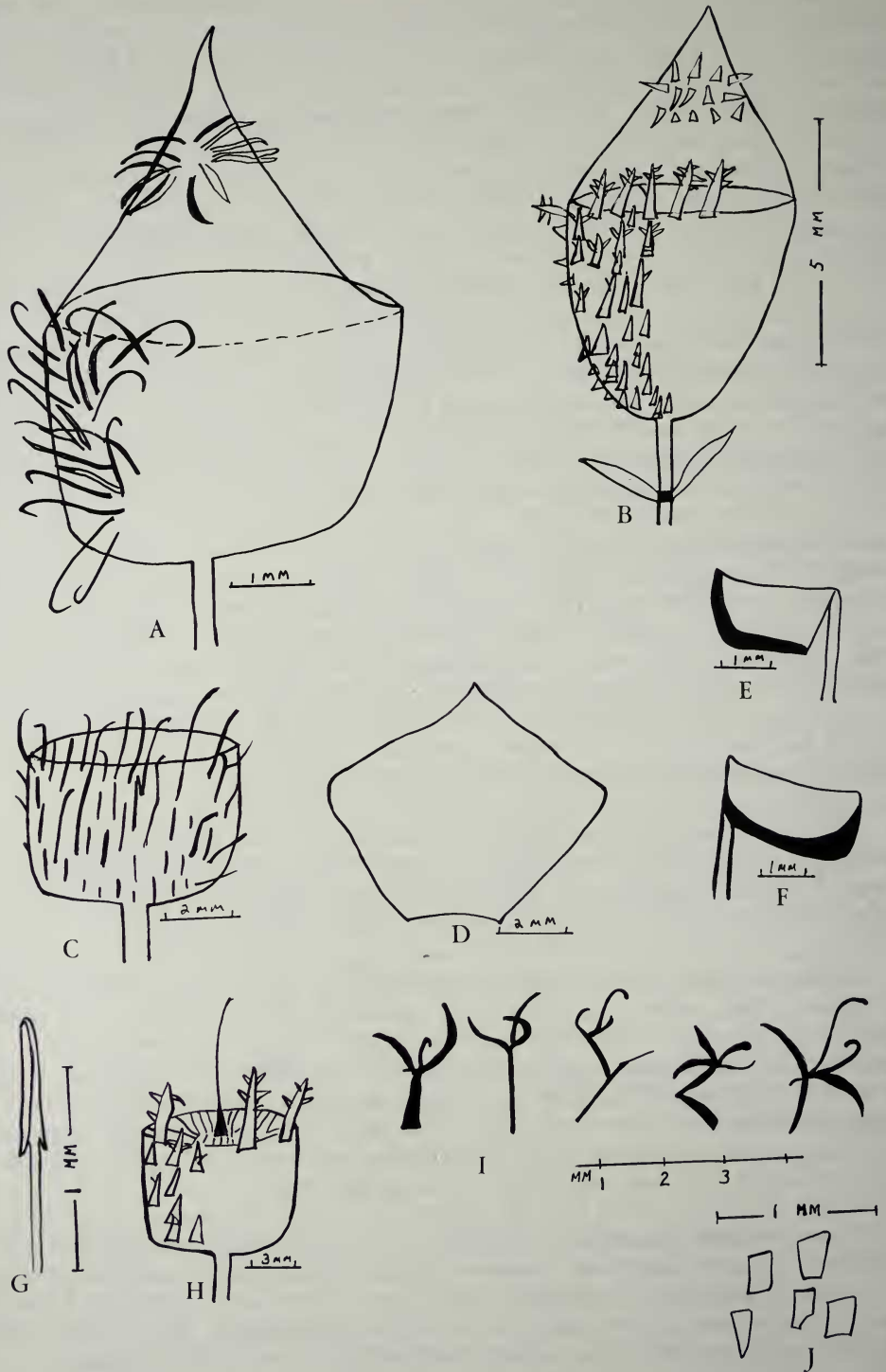


Fig. 3. *Pternandra azurea* (B.L.) Burk. var. *azurea* - - A: Endert 3195; B: Luang 21736; C, D, E: Mikil 31450; F, G: Luang 22383; H: Luang 21874; I: Kostermans 9043; J: Ashton 19923.

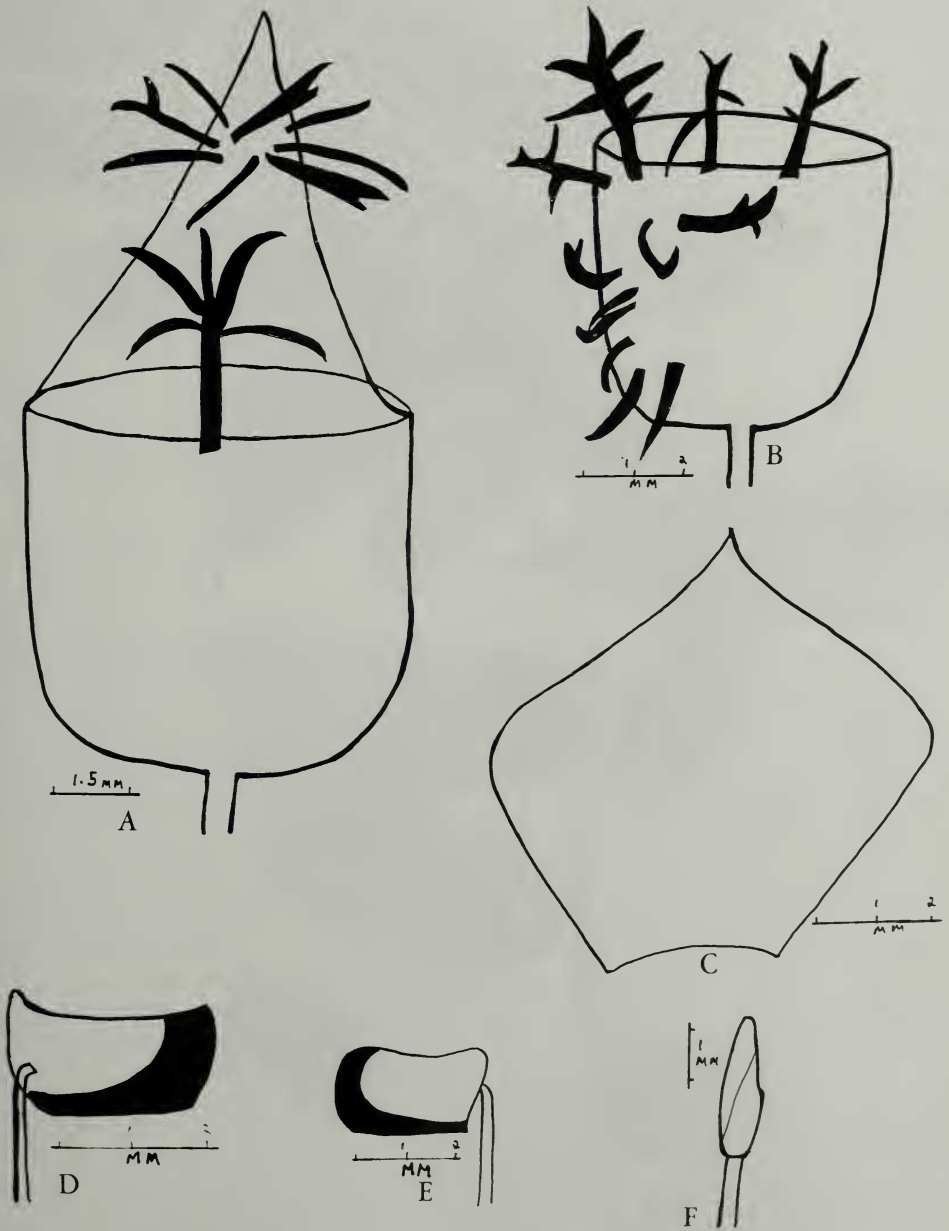


Fig. 4. *Pternandra azurea* (B1.) Burk. var. *cordata* (Korth.) Maxw. - - A-D: de Wilde & de Wilde-Duyfjes 12829; E, F: Batten-Pooll sn (Sobiga, Sumatra).



Plate 1. *Pternandra azurea* (B1.) Burk. var. *cordata* (Korth.) Maxw. This is the holotype of *Kibessia tetraptera* Miq. which Bakhuizen f. reduced to a synonym of *Kibessia cordata* Korth. in 1943. *K. cordata* was recombined by Baillon in 1880 as *Pternandra cordata* (Korth.) Baill. and has been given varietal status in this revision. Photo: Rijksherbarium, Leiden.

Nayar which has tessellate or tuberculate calyx scales. The winged branches and cordate blades of both taxa are quite similar, however the intramarginal nerve in the latter species is usually more prominent and often the venation appears to be 5-nerved. Furthermore, the calyx cap in *P. tessellata* is smooth or has minute tubercles and the blades are usually glabrous below.

Fig. 4. A, B: calyx; C: mature petal; D, E: stamens; F: stigma.

Plate 1. Holotype of *Kibessia tetraptera* Miq.

Distribution: (specimens examined in addition to those cited by Bakhuizen f., 1943 and 1943–45, p. 317)

Sūmatra Aek Moente, Asahan: Boeea 9363; Gunung Leuser: de Wilde & de Wilde-Duyfjes 12829; Gunung Malintang: Korthals sn (holotype U); Kapoeas: Teysmann 8655; Loemban Ria, Asahan: Boeea 7604; Pajakumbua: Meijer & Vermeulen 5401; Palembang: Dumas 1576; Pargam Biran, Asahan: Boeea 5739; Siberut Island: Boden-Kloss 14558; near Sobaiga: Batten-Pooll sn; Taram: Meijer 6716, 6799; Tapanoeli: Opper Angkola: Junghuhn sn (*Kibessia tetraptera* Miq., holotype U, isotype L); W. Indragiri: Meijer 4311.

Borneo Sarawak — Bergark: Haviland 107; Penkulu: Haviland 173.

Kalimantan — Gunong Kenepai: Hallier 1601.

4. ***Pternandra cogniauxii*** Nayar, Bull. Bot. Survey India 17 (1978) 52. *Ewyckia cordata* Korth. in Temm., Verh. Nat. Gesch. (1844) Bot. 255; Walpers, Repert. 5 (1845–46) 724; Baillon, Hist. Pl. 7 (1880) 23; not *Kibessia cordata* Korth., l.c. 253 (= *Pternandra azurea* (Bl.) Burk. var. *cordata* (Korth.) Maxw.). *Macroplocis cordata* (Korth.) Bl., Mus. Bot. Lugd.-Bat. I:1 (1849) 7 and fig. 3; Naudin, Ann. Sci. Nat. 3:18 (1852) 260; Walp., Ann. 2 (1850–51) 612; Naudin, Ann. Sci. Nat. 3:18 (1852) 260; Miquel, Fl. Ned. Ind. I (1855) 569. *Rectomitra cordata* (Korth.) Triana, Trans. Linn. Soc 28:1 (1871) 153. *Kibessia korthalsiana* Cogn. in Boerlage, Handl. Fl. Ned. I (1890) 537, *nomen* and in DC., Monogr. Phan. 7 (1891) 1111; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 451; Schwartz, Mitt. Inst. Bot. Hamburg 7:3 (1931) 257; Bakhuizen f., "Thesis" (1943) 319, Med. Mus. Bot. Utrecht 91 (1943) 319. Rec. Trav. Bot. Neerl. 40 (1943–45) 319; not *Pternandra korthalsiana* (Miq.) Triana, l.c. 153 (= *Pternandra tuberculata* (Korth.) Nayar). *Pternandra cardiophylla* Ohwi, in *scheda* (L, BO, SING).

Shrub (epiphytic or hanging) up to 5 m tall, diameter up to 4.5 cm, or a tree up to 5 m tall with a diameter of up to 7 cm. Bark c. 0.25 mm thick, grey to light brown; inner bark c. 0.5 mm thick, white; branching nearly down to the base of the plant. Branchlets somewhat flattened and grooved on two faces below the upper node, becoming cylindrical below, glabrous, c. 2–2.5 mm thick; epidermis brownish, flaking off and leaving a smooth, greyish surface. Blades subcoriaceous, glabrous, narrowly to broadly ovate, acuminate at the tip (acumen 1–1.5 cm long), broadly rounded and usually shallowly (2–5 mm) cordate at the base; distinctly 5-nerved from the base, nerves sunken above, prominently raised and tapering below, lateral nerves less prominent than the mid-vein, the two peripheral veins merging with margin in the upper 1/4 of the blade; intramarginal nerves thin, c. 1 mm from and merging with the margin in the lower 1/3 of the blade; secondary venation pinnate from all 5 main veins, c. 20–30 pairs, distinct above, slightly raised below, anastomosing and reticulate; drying brownish with an olive hue above, brown below; 14–20 cm long, 5.5–10 (12) cm wide near the base. Petioles flat-

tened, glabrous, 1.5–3 mm long, 3–4 (6) mm wide. Inflorescences mostly from behind the leaves, often on branches up to 1.5 cm thick, or in the axils of the lowest leaves, glabrous, solitary or fascicled often on raised tubercles; axes cylindric, smooth, c. 0.75 mm thick. Bracts lanceolate to ovate, acute, c. 1–1.5 mm long. Primary axes 1–7, with one or less commonly two nodes, 2–3 mm long, elongating 1 or 2 mm in fruit; pedicels 1–3 mm long, elongating to 5 mm in fruit. Calyx tube campanulate-cyathiform, glabrous, c. 4.5 cm high, 3–4 mm wide, densely covered with tuberculate scales which are thicker near the margin, red; glabrous inside with 16 fine vertical lines; cap dome-shaped, splitting into 4 thin, broadly triangular, persistent lobes, each 5 mm long, 3.5 mm wide, covered with thick tubercles externally, smooth inside, reflexed at maturity. Petals (*ex* Cogniaux and Bakh. f.) obovate, obtuse, 3–3.5 mm long, 2.5 mm wide, pink, white, or whitish-purple. Filaments flattened, 2.5–3 mm long, whitish; anthers hatchet-shaped, inappendiculate, 2.5 mm long, 1 mm wide, yellow. Stigma 4-lobed, c. 1 mm long, whitish-purple. Style slender, 7–9 mm long, glabrous, often persisting in fruit, white. Fruits urceolate, nearly smooth or sparsely tuberculate near the base, scales elongate, diamond-shaped, not or slightly umbonate, more tessellate near the rim and neck, 7–8 mm long, 7–8 mm wide, glabrous, pinkish-red, maroonish, and finally purplish when ripe; areolus 4–5 mm wide, smooth or with several faint lines, and glabrous inside; calyx lobes persisting; pericarp c. 0.5 mm thick. Seeds numerous, flattened, rhombic-cuneate, quadrangular, c. 0.75 mm long, glossy light brown.

Habitat: primary forests, secondary scrub.

Vernacular: puloh (Iban), timberas burung (Banjar-Malay) seri seri (Utan), pura saie (Bidayuh).

Pternandra cogniauxii Nayar is easily distinguished from all other taxa of *Pternandra* by its relatively large, 5-nerved, cordate blades; solitary or fascicled flowers from behind the leaves; and the urceolate fruit with a nearly smooth or slightly umbonate pattern and persistent, tuberculate calyx lobes. The fruit resembles that of *P. galeata* (Korth.) Ridl. in basic shape, however the scales in *P. galeata* are tessellate throughout, while in *P. cogniauxii* the pattern is more raised; also the calyx lobes in *P. galeata* are smooth on both sides.

Bakhuizen f. notes that *Kibessia elmeri* Merr. is similar to this species, however his opinion seems to be based entirely on Merrill's comment at the end of the original description. This species, in my opinion, is *P. galeata* var. *elmeri* (Merr.) Maxw.

Due to confusion on the part of previous authors, it has been necessary to establish a new name for this species. The original name, *Ewyckia cordata* Korth. (described from material collected by Korthals, s.n., in Borneo, and maintained in the Lieden collection) cannot be used because it is a later homonym of *K. cordata* Korth. (now *P. azurea* (Bl.) Burk. var. *cordata* (Korth.) Maxw.). Cogniaux, realizing this, changed the name to *K. korthalsiana* Cogn. Unfortunately, *P. korthalsiana* (Miq.) Triana (based on *Ewyckia korthalsiana* Miq. (Fl. Ind. Bat. Suppl. 1 (1860) 321) is not a proper name for this species since, in my opinion, it is the same as *P. tuberculata* (Korth.) Nayar (specifically *P. griffithii* King). Cogniaux and Bakhuizen f. both placed it under *P. coerulescens* Jack. In any case, the epithet *korthalsiana* cannot be used for any other species of *Pternandra* since *P. korthalsiana* was validly published by Triana, even though it is a completely different species from *K. korthalsiana* Cogn. The epithet *cogniauxii* was selected in an effort to clear the confusion and misunderstanding in this literature and various herbaria concerning this species. *P. cogniauxii* Nayar, as far as I can determine, is endemic to Borneo. This species has been named in honour of Celestin Alfred Cogniaux (1841

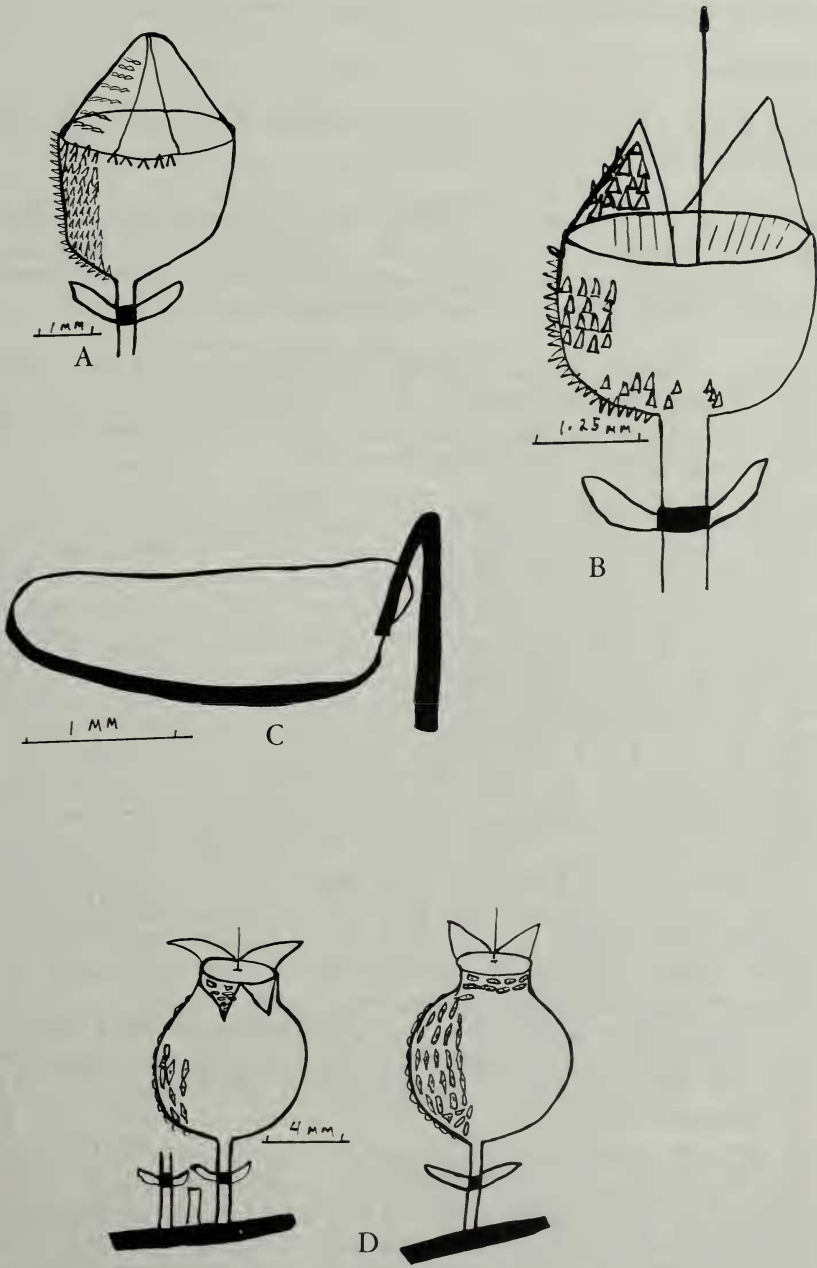


Fig. 5. *Pternandra cogniauxii* Nayar -- A, D: Haviland (=174)B; B, C: Mamit 33396.

1916), a French botanist, who published a comprehensive monograph on the Melastomataceae in 1891.

Fig. 5. A: calyx with calyptra; B: calyx with split calyptra; C: stamen; D: fruit.

Distribution:

Borneo. Sabah — Beaufort: Cuadra 1363; Mt. Dulit: Richards 2562; Mt. Kinabalu: Clemens 26355, 26873.

Sarawak — Bau: Purseglove 4457; Bukit Temudok, Simanggang: Anderson T29; Kampong Sadir: Mamit 33396; Kota For. Res.: Chai & Paie 31104; Penkalan Ampat: Haviland sn in 1889; Rajang River, Kapit: Jacobs 5457; Stabut, Padawan: Mamit 29829; Ulu Dapoi, Tinjar: Paie 23054; exact location unknown: Haviland (=174) B.

Kalimantan — Gunong Rantau: Korthals sn (*Ewyckia cordata* Korth., holotype L); Ingaran: Nooteboom 1328; W. Koetai: Endert 2659, 2931, 4970; Mentawir, Balikpapan: Sauvour K5, 133; Mt. Rikai: Hallier 1308; Mt. Trusmadi: Nooteboom 1474; Tarakan: Meijer 2537; exact location unknown: Korthals sn (L).

5. ***Pternandra coerulescens*** Jack, Malay Misc. 2:7 (1822) 61; Hooker, Comp. Bot. Mag. I (1835) 157, Calcutta J. Nat. Hist. 5:15 (1843) 309; Triana, Trans. Linn. Soc. 28 (1871) 153 ("*caerulescens*"); Cogniaux in Boerlage, Handl. Fl. Ned. Ind. I (1890) 536; Cogniaux in DC., Monogr. Phan. 7 (1891) 1102; Krasser in Engler & Prantl, Die Nat. Pfl. Fam. 3:7 (1893) 196; King, J. As. Soc. Bengal 69, II:1 (1900) 68 (Mat. Fl. Mal. Pen. 3, 476); Clarke in Schmidt, Fl. Koh Chang VI (1902) 195; Gibbs, J. Linn. Soc. Bot. 42 (1914) 80; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 452 ("*caerulescens*"); Ridley, Fl. Malay Pen. I (1922) 808; Merrill, Ling. Sci. J. 13 (1934) 65 ("*caerulescens*"); Bakhuizen f., "Thesis" (1943) 324, Med. Mus. Bot. Utrecht 91 (1943) 324, Rec. Trav. Bot. Neerl. 40 (1943-45) 324; Li, J. Arn. Arbor. 25 (1944) 40 ("*caerulescens*"); Corner, Way. Trees Mal. ed. 2 (1952) 452; Ho, Fl. Vietnam (1960) 337 (plate 121E, "*cerulescens*"), 342; Keng, Gard. Bull. Sing. 31 (1978) 110. *Pternandra coerulescens* Jack var. *jackiana* (Walp.) Cl. in Hk. f., Fl. Brit. India II (1879) 551; *P. jackiana* (Walp.) Ridl., l.c. 808, Bakh. f., l.c. 325, *pro syn.*; *Ewyckia jackiana* Walp., Repert. Bot. Syst. 5 (1846) 734. *P. capitellata* Jack, l.c. 60, *P. coerulescens* Jack var. *capitellata* (Jack) King, l.c. 69; Bakh. f., l.c. 326, *syn. nov.*; *Ewyckia capitellata* (Jack) Walp., l.c. 724. *P. paniculata* (Miq.) Triana, l.c. 153. *P. coerulescens* Jack var. *paniculata* (Miq.) King, l.c. 69. *Ewyckia paniculata* Miq., Fl. Ned. Ind. Suppl. I, Sumatra (1860) 321; Bakh. f., l.c. 325 *pro syn.* *P. paniculata* Benth. ex Cl., l.c. 551; Cogniaux, l.c. (1891) 1104; King, l.c. 68, *pro syn.* and Bakh. f., l.c. 324, not *sensu* Ridley, l.c. 809 (= *P. tuberculata* (Korth.) Nayar). *P. coerulescens* Jack var. *cyanea* (Bl.) Cogn., l.c. (1891) 1104; Bakh. f., l.c. 327. *Ewyckia cyanea* Bl., Flora 14 (1831) 525, *syn. nov.* *Ewyckia latifolia* Bl., Mus. Bot. Lugd.-Bat. I (1849) 6. *Pternandra latifolia* (Bl.) Triana, l.c. 153; Merrill, l.c. 452. *Ewyckia latifolia* Bl. var. *membranacea* Bl., l.c. (1849) 6, *syn. of var. cyanea* by Bakh. f., l.c. 327. *P. coerulescens* Jack var. *membranacea* (Bl.) Furtado in *scheda* Herb. Sing. *Ewyckia medinilliformis* Naud., Ann. Sci. Nat. 18 (1852) 261. *Memecylon oligoneuron* Bl. var. *maluense* Mansf. in Engler, Bot. Jahrb. 60 (1925) 139, *syn. nov.*

Tree up to 20 m tall with a diameter up to 90 cm; less frequently a shrub up to 5 m tall. Bark grey, greyish-red, brown, smooth, finely fissured, thin; slash inner bark fibrous,

light brown, very thin; cambium white; sapwood cream to yellow, very hard. Branchlets cylindrical, smooth 1–2 mm thick, brown to blackish when dry; epidermis peeling off of older branches, leaving a smooth brown surface. Blades extremely variable in texture, size, and shape; chartaceous, subcoriaceous, to coriaceous; lanceolate and acute at both ends; elliptic to ovate, acute or obtuse at the tip and narrowed or rounded at the base; or very broadly ovate to suborbicular with acute tips and in most specimens of this sort slightly narrowed to rounded at the base; 3-nerved from the base, nerves sunken above, raised and tapering to the tip below; intramarginal nerves thinner, 1–6 mm from the margin, arching to the tip; secondary venation pinnate from each of the 3 main nerves, obscure to prominent, anastomosing and reticulate; smallest blades 5–8 cm long, 2–3 cm wide; largest ones 18–25 cm long, 11–15 cm wide; dark green above, green to yellow-green below; drying dark brown to blackish or sometimes olive green above, brown to khaki-green below; entirely glabrous. Petioles flattened, 5–10 mm long, 1–3 mm wide, glabrous. Inflorescences extremely variable in size and branching; glomerulate, cymose, to paniculate; c. 7 mm to 7.5 cm long, glabrous, few to many-flowered; axes flattened with a groove on each narrow side, green; primary axes 1–3, mostly from leaf axils or on swollen leafless nodes (common in specimens with large, coriaceous blades), 0.75–2.0 mm wide at the base, c. 1 mm – 6 cm long with 1–5 nodes, each primary, etc. node subtended by a pair of ovate, acute, and often slightly keeled connate bracts, 0.5–1 mm long, persistent; smooth or with a reticulate pattern of flattened or slightly raised polygonal plates in a tessellate pattern; secondary axes not developed or up to 2.5 cm long, tertiary axes none or up to 7 mm long, 4th axes not developed or up to 4 mm long, pedicels 1–4 mm long, solitary on the tips of each ultimate ramification. Calyx campanulate, tube with a tessellate, less frequently umbonate to somewhat tuberculate pattern; truncate or with 4 minute cusps on the margin; smooth internally and without lines or ridges; 2.5–4 mm long, 3–3.5 mm wide; green, drying brown to black. Petal buds conical, lobes imbricating to the right, c. 3 mm long; mature petals thick with thinner margins, broadly ovate to suborbicular, acute to mucronate at the tip, rounded or shortly clawed at the base, reflexed at maturity, 2–6 mm long, 2–4 mm wide; white, lilac, or blue; margins white to purple. Filaments flattened, 2–4 mm long, often flexed or curved at maturity, violet; anthers inflexed in bud, then elevating with their dorsal surfaces at 90° to the filament, thus forming a flat topped ring about the style, finally becoming erect (180° to the filament) with the locules facing the style, c. 2–3 mm long, c. 1 mm wide, yellow or violet. Stigma clavate-cylindrical, c. 1 mm long, yellow. Style slender, straight, 4–7 mm long; fruiting axes often elongating a few mm and becoming thicker. Fruits subglobose (slightly wider than long, and when immature appearing somewhat urceolate) or globose, 4–6 mm diameter, capped by the thinner margin of the calyx, areolus 2–3 mm wide, style often persisting; exocarp in immature fruit tessellate, becoming obscured or nearly smooth with maturity; green or yellow-green then purple when ripe, drying black; pericarp c. 0.25 mm thick. Seeds numerous, flattened rectangular-quadrant, c. 1 mm long, 0.5 mm wide, glossy tan.

Pternandra coerulescens Jack is easily distinguished from all other species of *Pternandra* by the truncate calyx (no calyx cap), tessellate pattern on the calyx tube and fruit, and subglobose to globose fruits. *P. multiflora* Cogn. has similar floral features, but has a much larger inflorescence and yellow petals. *P. coerulescens* is often confused with *P. galeata* (Korth.) Ridl., however the latter species has a calyx cap which splits into 4 persistent calyx lobes and urceolate fruit.

Vernacular: cursed shade, lidah katak, sial menahun, pako bonnot paya, sial menan, nipis kulit, kayu kuku bami (Malacca), mempyang (Selangor); sireh sireh (Borneo Malay), puloh (Iban), kalombayng (Dusun), sari sari (Brunei), dulang dulang (Kedayan), ubah meskalak (Sarawak); memeteng (Sumatra); New Guinea: mereiie (Arfak), merie (Sidei).

Delimiting the range of variation of this species has never satisfied many botanists, thus numerous species and varieties have been described as being distinct from Jack's original description. For the Malay Peninsula King includes four varieties (including the typical variety), while Ridley considered all four of them as distinct species. Bakhuizen f. lists all of these taxa under three varieties (including the typical variety) of *P. coerulescens*.

King notes that the species is very variable and that some specimens are intermediate between varieties. From the large collection of *P. coerulescens* in the Singapore and Leiden herbaria it is quite obvious that the variation in the size of the leaves, length of the inflorescences, and number of flowers confirms King's observation. The variation is so complex, and in many collections impossible to delimit, that I have decided to include all related taxa as synonyms of *P. coerulescens*; thereby giving the species an extremely wide range of variation in the leaves and inflorescence. This idea is completely justified by the gradation of these variable characteristics in specimens from Thailand to New Guinea. It is also necessary to note that none of these taxa are based on any structural features and that the flowers and fruits of all the specimens examined are essentially the same.

Pternandra coerulescens Jack var. *jackiana* (Walp.) Cl. has short cymes (primary axes 5–10 mm) with few flowers. Sessile or shortly peduncled (3 mm) inflorescences with larger leaves (11–25 cm long, 9–15 cm wide) have been separated as var. *capitellata* (Jack) King. Finally, specimens with a large, branching, many-flowered inflorescence with many rudimentary leaves have been designated as var. *paniculata* (Miq.) King. This variety is based on a specimen which has an abnormal (witches broom) inflorescence. While there are many specimens in the Singapore and Leiden collections which can be definitely placed in one of these varieties, there are many other collections which include characteristics of two varieties, or are intermediate between them.

For the specimens with large leaves (aff. var. *capitellata*) there is Moysey & Kiah 33638 which has a subsessile inflorescence (primary axes 1–2 mm with 2–3 flowers per axis); Sinclair 39635 has longer axes (5–10 mm) and more flowers (aff. var. *jackiana*); and Ridley s.n. (Province Wellesley, June 1890) has a larger inflorescence which can be considered as the typical variety (*sensu* Bakh. f.). From these three specimens it is clear that the size of the leaves cannot be correlated with the length of the inflorescence, *vice versa* and that var. *capitellata* includes characteristics shared by the original limits of the other varieties.

Another series linking these varieties includes Suppiah 14820, which has the axes ranging from 4–7 mm long; Murdoch 263, 8–20 mm, and T. & P. 76 (2676) with the axes 6–8 mm long. The leaves of all three of these collections are small (7–9 cm long, 3–4 cm wide), except with T. & P. 76 (2676) which also has large var. *capitellata*-like leaves.

Cantley 2948 and Ridley 2009b have the short var. *jackiana* kind of inflorescence, while with Haniff 367 the axes (in fruit) are c. 2 cm long – intermediate between var. *jackiana* and Ngadiman 34652 which could easily be included as the typical variety due to the relatively large inflorescence. The leaves of all four of these sheets are the same (6–9.5 cm long, 4–5 cm wide, and of similar texture). Finally, Kiah 37737 is few-flowered with the primary axes c. 1 mm long which contrasts remarkably with Kiah 32429 which has the large, branching inflorescence of the typical variety. The branches and leaves on these two sheets are identical.

The type collection of *Ewyckia cyanea* Bl. (Moluccas) at Leiden has relatively thin and narrow blades with short inflorescences. The type specimens of *E. latifolia* Bl. (Borneo) have slightly thicker and larger blades with identical inflorescences. It is quite obvious that the two taxa are the same. From the limited number of collections available, all the specimens of *P. coerulescens* s.s. from the Moluccas and Celebes have relatively thin, narrow *E. cyanea*-type blades. New Guinea has collections with both *E. cyanea* and *E. latifolia*-type leaves. This is also true in Borneo, Sumatra, the Malay Peninsula, and Thailand where both are common. In many collections the thicker blades of *E. latifolia* and short inflorescences are intermediate with those of what Bakhuizen f. considers the typical variety of *P. coerulescens*, i.e. the inflorescences are larger. Haviland (=2203)Y (Borneo), Singh 1079 (Johore, W. Malaysia), and Smitinand 5659 (SE. Thailand) are some examples which illustrate that var. *cyanea* (including *E. latifolia*) cannot always be distinguished from typical *P. coerulescens*.

E. latifolia Bl. var. *membranacea* Bl. (Borneo) has larger and thinner blades, but otherwise does not differ from *E. latifolia*. Var. *membranacea* is matched by specimens with both large and small blades, e.g. Amir 35638 (Sabah), which links it to *E. cyanea*.

The blades and small inflorescences of *E. latifolia* merge with the typical variety through Sanusi 5327 (Sarawak), and Mikil 37737 (Sabah) which are intermediate in the size of the inflorescences. The blades are of both the thin and thicker types.

The collections from Sumatra also show that there is much variation of *P. coerulescens* and that the numerous taxa that have been split from it can not always be distinguished or even properly defined. Soepadmo 134 links *E. latifolia* and *E. cyanea* with Toroes 3835, which has a long inflorescence; and Alston 14331, which has a short inflorescence. The variability of the leaves and inflorescences of the Sumatran material is the same as that for Borneo; thus there is considerable mixing of traits in many collections, while in others it is true that they match the various varieties that other authors have described.

The very large blades of *P. coerulescens* from the Malay Peninsula, which usually have a very short (var. *capitellata*) inflorescence, are not common in Borneo and I have not found any in the collections from the Celebes and New Guinea. These larger blades, as noted above, merge with smaller and thinner blades, which have small or large inflorescences and could be identified as var. *cyanea* or the typical variety.

Several collections, e.g. Hou 537 and 545, Paie 26926, and Brooke 10640 (all from Sarawak) have small, thick blades with indistinct secondary venation; and short inflorescences (var. *capitellata*) appear to be distinct from all other variants of *P. coerulescens*. These specimens can be linked to *E. latifolia* and the typical variety through other specimens with various combinations of thinner blades (Bunnemeyer 7504, from the Lingga Archipelago) or larger inflorescences (Soepadmo 134, Sumatra).

The gradation of the specimens from the Malay Peninsula and the Malay Archipelago is quite striking, and from the examples noted above there is no doubt in my mind that there is no solid basis for maintaining any of the taxa which have been split from *P. coerulescens*. I have attempted to sort all the specimens according to leaf shape and size and length of the inflorescence. As a result many groups include a bewildering assemblage of contrasting characteristics, i.e. the variation of the leaves and inflorescence is so mixed that it is virtually impossible to group many sheets beyond an individual basis.

As far as flowers are concerned there is some variation in the size and ornamentation of the calyx and length of the filaments; and shape of the petals; but the shape of the anthers and features of the stigma and style appear to be nearly the same. King notes that 3 or 4 anthers are imperfect, however in all of the flowers (including a liquid collection, Maxwell 77-23, from Singapore) dissected all 8 of the stamens are of the same shape and size.

The calyx in most specimens is ornamented with flat, smooth, tessellate plates. This feature does not correlate in any way with leaf or inflorescence characteristics. In some other specimens the ornamentation is of raised warts which appear umbonate or even slightly tuberculate; and again, specimens in the Singapore and Leiden collections with this type of pattern have variable leaf and inflorescence sizes. Symington & Kiah 28774 has a var. *capitellata* inflorescence and Maxwell 77-23 a larger one that could easily be considered as the typical variety; the blades in the former are rather thin and narrow (aff. *E. cyanea*), while in the latter they are coriaceous and considerably wider (typical variety). The calyx is umbonate-tuberculate in both specimens.

A smooth, tessellate pattern is found in Ridley s.n. (Province Wellesley, June 1890) and the specimen could easily be considered as being the typical variety; and with Moysey & Kiah 33638 (var. *capitellata*), both with large leaves, and in the small-leaved specimen collected by Suppiah (14820) which has a var. *jackiana* style inflorescence. Thus, the tessellate calyx pattern is common to specimens of all the varieties.

In general, however, many of the var. *paniculata* specimens have a warty or tuberculate pattern and these have been properly identified as *P. tuberculata* (Korth.) Nayar. In other specimens with the abnormal inflorescence the calyx pattern is tessellate (*P. coerulescens*). Sometimes the pattern is extremely variable and inconsistent, that is leaf, inflorescence, and calyx characteristics do not form a clear series in which correlation of these traits is possible. In at least one specimen, Henderson 10012, (inflorescence = var. *capitellata*) both the smooth and raised patterns are found.

One exceptional specimen, Derry 1159, has a tuberculate calyx very much resembling *P. tuberculata*, but the absence of a calyx cap and the anthers distinguish this as *P. coerulescens*. The inflorescence is rather large and, as far as this trait is concerned, is easily included as the typical variety. This particular specimen and several others were incorrectly annotated by Furtado (Herb. Sing.) as *K. tuberculata* since the tuberculate pattern of many is similar to this species. Dissection of flowers to examine the stamens and presence of a calyx cap is necessary in order to distinguish many of these specimens.

I do not agree with Bakhuizen f. in reducing *Kibessia simplex* Korth. var. *oblonga* Bl. to a synonym of *P. coerulescens*. The holotype of the variety (Teysmann s.n., from Borneo) lacks buds, but the leaves suggest close affinities with *P. azurea* (Bl.) Burk. and thin-bladed specimens of *P. tuberculata*.

Bakhuizen f. also reduced *Kibessia angustifolia* Bl. to a synonym of *P. coerulescens*. The holotype (Waitz s.n., from Borneo) is without flowers or fruits, but the angled branches; and thin, narrow leaves strongly resemble those of *P. echinata* Jack. These vegetative parts are, in contrast to the puberulous indumentum of *P. echinata*, entirely glabrous.

The holotype of *Ewyckia paniculata* Miq. at Utrecht (Teysmann s.n., from Bangka Island) has abnormal inflorescences in which the axes and bracts are larger than normal

and frequently with deformed buds. The holotype has some normal buds and these are identical to those of many typical specimens of *P. coerulescens* Jack. I am certain of this since the deformed buds lack calyx lobes or a calyx cap. Wallich cat. 4080, which Bentham named as *P. paniculata* Benth. ex Cl. also has abnormal inflorescences similar to those of *P. paniculata* (Miq.) Triana — the latter being reduced by Cogniaux to a synonym of the former, and both species to *P. coerulescens* Jack by Bakhuizen f. King considered *P. paniculata* Benth. ex Cl. as an abnormal form of *P. coerulescens* Jack. Ridley was of the opinion that *P. paniculata* Benth. ex Cl. is a form of *P. griffithii* King with a large, abnormal inflorescence. While the branches and leaves of the two respective type specimens are similar, the flowers do not match. The calyx tube of *P. griffithii* King is tuberculate and there is a distinct cap which splits into 4 lobes. In *P. paniculata* Benth. ex Cl. the calyx tube is tessellate and there is no cap. *P. griffithii* King is, therefore, not related to, while *P. paniculata* Benth. ex Cl. is identical to *P. coerulescens* Jack. *P. griffithii* King is, in my opinion, the same as *P. tuberculata* (Korth.) Nayar.

Furtado annotated several specimens in the Singapore collection as *Pternandra coerulescens* Jack var. *membranacea* (Bl.) Furt. with the added comment that the taxon is the same as var. *cyanea* (Bl.) Cogn. These specimens have the short var. *jackiana* inflorescence, however the blades range in texture from subcoriaceous (Ridley 12113) to coriaceous (Ridley 6217, 2009b). The leaves are all of the smaller (c. 8–12 cm long, 4–8 cm wide) size. As with all the other varieties described for *P. coerulescens*, var. *membranacea* (Bl.) Furt. is neither distinct nor constant and, therefore, should be combined with all other varieties of this species into a single taxon.

Ewyckia cyanea Bl. predates *E. latifolia* Bl. var. *membranacea* Bl. and along with the fact that Furtado's new combination was never published, and is therefore invalid, var. *membranacea* (Bl.) Furt. should be ignored.

Ewyckia korthalsiana Miq., which Cogniaux considered the same as *P. capitellata* and a synonym of var. *cyanea* by Bakhuizen f., is more closely related to *P. tuberculata* (Korth.) Nayar (specifically *P. griffithii* King). As the holotype of *E. korthalsiana* is without flowers or fruits, it is difficult to determine its exact relationship with *P. coerulescens* and *P. tuberculata*. Miquel's original description, however, indicates that the calyx is 4-dentate with an areolate-verruculose pattern. This is good evidence to support my belief that it is actually a synonym of *P. tuberculata*.

A specimen collected by Ledermann (s.n., from New Guinea) labeled *Memecylon oligoneuron* var. *maluense* Mansf. in the Singapore collection is definitely *P. coerulescens* Jack with a short inflorescence. Mansfield's short description of this variety fits the specimen quite well, thus I am assuming that this specimen represents the taxon even though I have not seen the type specimen (Ledermann 7007).

Fig. 6 A: inflorescence; B: flower bud; C: mature petal; D: stamen.

Plate 2. Holotype of *Ewyckia paniculata* Miq.

Distribution:

Hainan — Hung Mo Shan: Tsang & Fung 18034 (not seen, q.v. Merrill (1934) and Li (1944)).

Thailand. Trat: Chang Island: Klong Haat Sy Dang — Maxwell 74-425, Klong Nayom — Kerr 6827, 6828A; Takum: Kerr 17869.

Chumpon — sine. coll. 46.

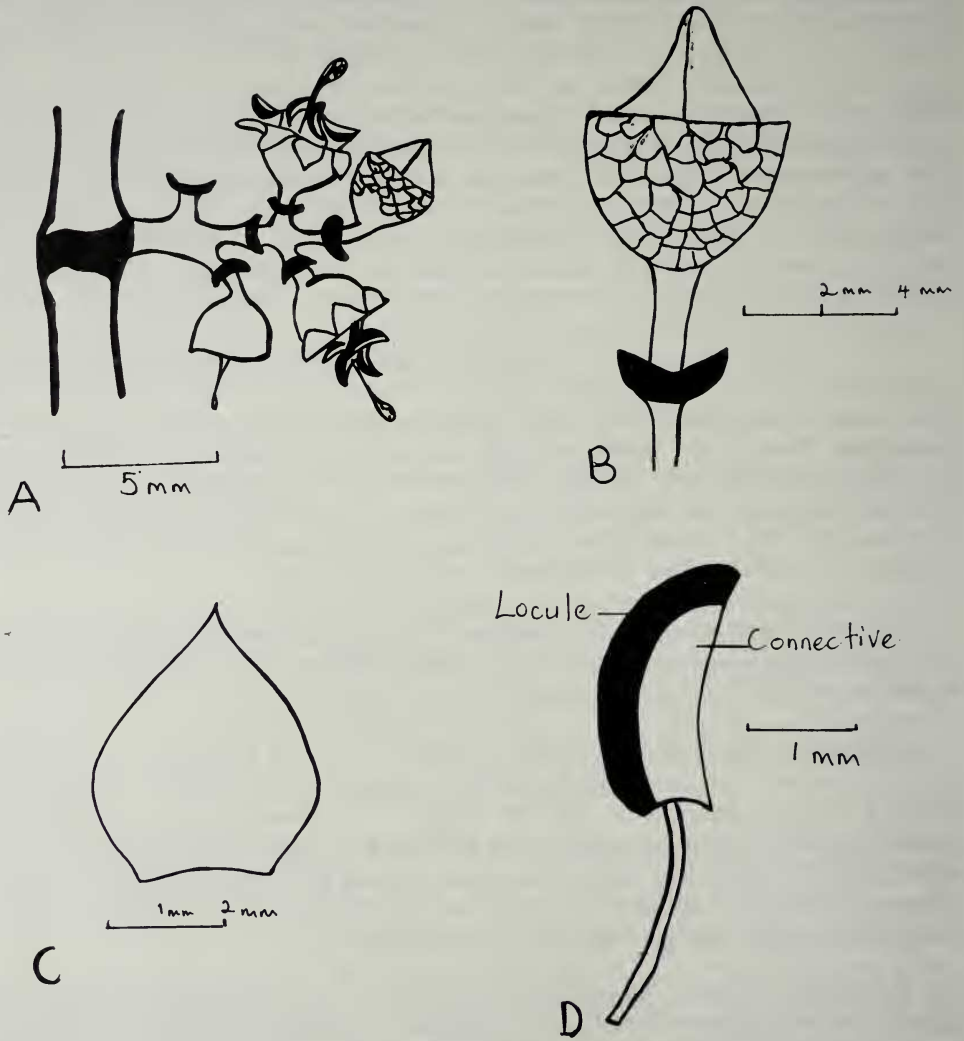


Fig. 6. *Pternandra coerulea* Jack -- A-D: Sinclair 39635.

Surat Thani – Kaw Pa-Ngan: Put 758; Langsuan, Tako: Put 1696; Nawng Wai: Kerr 12270; Tung Luang: Kerr 12510.

Puket Island – Haniff 367.

Nakorn Sithammarat – Ban Natawn: Kerr 15650; Ban Plien: Kerr 15654; Tung Song, Ban Pa Prek: Rabil 192.

Satun – Lakshnakara 346; Teratao Island: Kerr 14166.

Songkla – Hat Yai: Kerr 13538, Pradit 232; Natawee: Rabil 71, 91.

Narathiwat – Bacho: B. Sangkhachand 141; Kao Re Chaw, Toh Moh: Lakshnakara 744; Nikomwang: Prayad 431.

W. Malaysia Kedah – Bukit Enggau: Everett 13752; Bukit Perak: Everett 13695; Bukit Sama Ganjah: Baba 21483; Bukit Selambau: Meh 8989; Gunong Bongau: Harun 17710; Gunong Jerai: Meh 9040, 10160; Inchong Estate: Spare 3806; Kedah Peak: Ridley sn, June 1893; Kochommen 16327, Stone, Mahmud, Sharif 8539; Langkawi Is.: Haniff 15527; Mukim Sik: Dolman 21512; Pantai Acheh: Symington 37382; Pantai Chichak: Meh 10182, Sungei Batu Asah: Ridley 15527; Sungei Rohan: Arshad 18029, Symington 20875; Ulu Muda For. Res.: Bray 11508; Ulu Tawar Res.: Meh 12569; sine loc.: Meh 21891.

Wellesley – Kriai: Ridley 2009b, sn in June 1890; Nibong Tebal: Curtis 3470.

Penang – van Balgooy 2412; I. H. Burkill 382, 3303; Chelliah 98142; Corner sn at Balek Palu; Curtis 67, 879, sn at Government Hill; Muka Head: B. & K. Bremer 1770; Penang Hill: King sn on 22 Aug. 1879, Nur 1235, Patt sn, Ridley sn in Dec. 1895 and Jan. 1921, Selvaraj 99671, Shukor 104, Sidek 232, Sinclair 39033, H. Singh & Samsuri 196, Stone 6352; sine loc.: Wallich 4077 (neotype K), 4079, 4080, ? Wallich 3143; Shimizu et al. 12969, 13160; Flippance sn on 27 Oct. 1932.

Perak – Batu Hampar, Taiping: Shah & Sidek 1159; Batu Tajoh: Wray 2156; Bikum Sougkai: Murdoch 366; Bintan Hijan For. Res.: Everett 14505; Dindings: Murdoch 263, Ridley sn on 12 March 1896; Goping: King's collector 822, 839; Grik: I. H. Burkill 12391, Corner sn, Ismail 95009; Gunong Bubu: Cockburn 11940; Ipoh: Curtis 3159; Keledang: Ridley 9685; Kota: Wray 3254; Larut: Wray 3975; Lumut For. Res.: Whitmore 0975; Pondok Tanjong: For. Dep't Fed. Mal. States 1141, Sallih 9721; Pulau Lanang: Seimund sn on 22 Nov. 1925; Pulau Rumbia: Lowry 479; Sungai Krian Estate: Spare 34458, 34566; Sungei Larut: Wray 2872; Taiping: Everett 13586, For. Dep't. Fed. Mal. States 1155, Henderson 10012, Ridley 14686; Wray 1952, 2390; Telok Auson: Haniff 14305; Waterfall: Fox 28; sine loc.: King's coll. 864, Scortechini 43, Wray 3607.

Kelantan – Bukit Baka, Machang: Shah & Shukor 3192; Chabang Tongkat: Suppiah 108872; Kemahang: Whitmore 8884; Sungei Mering: Ng 5483; Sungei Perias: Whitmore 4109.

Trengganu – Bauk For. Res.: Chan 16878, Whitmore 3942; Kemaman, Ulu Bendong: Corner 30026; Kemaman: Corner sn on 22 June 1932; Sekayu: Loh 13466, Shing 13536; Sungei Loh: Cockburn 10720, 10735; Sungei Pelong: Suppiah 14815, 14820; Ulu Brang: Moysey & Kiah 33638, 33834; Ulu Sungei Trengganu: Cockburn 8499, 10552; Kemaman, north of Sungei Ayam: Whitmore 20183.

Selangor — Bangi For. Res.: Jaamat 10925; Batu Tiga: Ridley 12113; Ginting Simpah: Stone 9568; Gunong Simpah: Strugnell 11226; Kepong: Ng 100014; Klang For. Res.: I. H. Burkill 961; Kuala Lumpur: Curtis 2337, Mat 7034, Hamid 4981; Kuala Selangor: T. & P. 211 (2811); Puchong: T. & P. 76 (2676); Raweang: Ridley 7329; Rice Res. Inst. Exp. Station: Kochummen 97760; Sungei Bulok: Sow & Tachon 16865; Singh, Samsuri, Sidek 381, 408; Sungei Pelok, Serang: Denny 4, 42; Sungai Tinggi; Nur 34132; Tasek: Ridley sn; Ulu Gombak; Hume 9229; sine loc.: Denny sn on 27 Nov. 1941.

Pahang — Aur For. Res.: Whitmore 3675; Balok For. Res.: Yeop 0842; Bukit Cheraga: Sohadi 14728, Whitmore 20021; Chini For. Res.: Bray 11627, Cockburn 11054, 11077, Shing 17288; Jenderok: Kadim & Mohmud 59; Kuantan: Symington & Kiah 28774; Lepar For. Res.: Suppiah 108954, 108979; Pekan: Ridley 1164, Maamat 16533; Taman Negara: Everett 14404; Tasek Bera: Henderson 24062; Titi Bungor: Henderson 10624, Whitmore 15366.

Negri Sembilan — Seuawang For. Res.: For. Dep't. Fed. Mal. States 1968; Tampai: Ridley sn.

Malacca — Batang: Derry 1159; Bukit Bruang: Derry 14; Chabau: Alvins 2249; Jus: Derry 15; Pengkalan Balak: Derry 31; Pulau Jarak: Seimund 78, 1142; Selandar For. Res.: I. H. Burkill 1356; Sungei Udang: Alvins 20, Holmberg 863; Tebong: I. H. Burkill 1334; sine loc.: Alvins 74, 648, 1151, 1284; Cuming 2316; Griffith 2273, sn; Maingay 801 (1212), 802 (1508).

Johore — Alor Bukit: H. Singh 561; Bukit Paloh Estate: Shah & Kadim 436; Bukit Panjang: Everett 14112; Endau: Kadim & Noor 294, Singh & Samsuri 1031; Gunong Belumut: Holttum 10770; Pahang: Singh & Samsuri 1079; Gunong Pulai: Maxwell 81-13; Kota Tinggi: Ridley sn in Dec. 1892, Teruya 409; Kuala Sedili: H. M. Burkill 1866; Kuala Teuba: Ridley 11080; Palai: Ridley 12167; Peugbury: Foxworthy 1176; Sungei Kayu: Kiah 32119, 32429; Singei Sedili Ketchil: Corner sn in June 1934; Virgin Jungle Reserve: Ahmad 359.

Singapore — Baker sn on 4 Nov. 1917; Cantley 2948, sn; Corner sn in July 1933; Hullett 320; Jumali 4414; Kiah 37737; Maxwell 77-23, 77-138; Ngadiman 34652, 34683, 36487; Nur sn on 30 Sept. 1915; Ridley 279, 2004, 6217, sn on 10 Feb. 1898, sn in May 1905, sn in 1911; Sinclair 39635; Keng & Jumali 4043, Ahmad 1366, 1464, Hill 1135.

Riouw Archipelago — Neth. Ind. For. Serv. 27671, 28613, 30001, 30029, 30089.

Lingga Archipelago — Bunnemeyer 7025.

Sumatra — Aek Moente, Asahan: Boeca 9314; Bangka Island: Kostermans & Anta 120, 381, 1001, 1344; Teysmann 3396 H. B. (*Ewyckia paniculata* Miq., *holotype* U, *isotype* BO); Damoeli, Koealoe: Toroes 1509; Goenoeng Si Papan: Toroes 3835; Gunung Leuser: de Wilde & de Wilde Duyfjes 13971; Gunong Sengalan: Matthew sn in 1913; Koealoe: Bartlett 6869, 6913; Muara Sakai: Alston 14331; Penjengat: Neth. Ind. For. Serv. 21525; Tantau Parapat: Toroes 2139; Tapanoeli, Sibolga: Neth. Ind. For. Serv. 31021; Upper Rhauw, Pakanbaru: Soepadmo 79, 134; W. Indragiri, Taluk: Meijer 4078; sine loc.: Buwalda 6292.

Borneo Sabah – Bayong, Mempakul: Tandom 4117; Binoni, Papar: Mikil 37737; Bukit Kuku, Sandakan: Meijer 20560; Bukit Padang, Jesselton: Meijer 19942, Tikau 33732; Gunong Dajak: Aet 200; Hindian For. Res., Beaufort: Singh 24384; Kibilo, Sandakan: Valera 1870; Lumat, Beaufort: Cuadra 1336, Kadir 1690; Lupak, Beaufort: Bunaar 25836, Kinted 15889; Meruba, Beaufort: Karim 80300; Sandakan: Amir 35638, Ampuria 32628, Creagh sn, Elleh 35596, Elmer 20194, Kadir 939, 3569; Puasa 4183; Sepilof For. Res.: Charington 20853, Patrick 42922; Subuga: Sam 34678; Sionggau: Brain 1291; Sungei Kapur: Meijer 22904, Singh 22883; Tawao: Elmer 20839, 21622.

Brunei – Bangawan For. Res.: Rahim 444, Alston 115; Bukit Gaharu, Serian: Paie & Ashton 16660; Kota Belud, Kappal: Gibbs 4342.

Sarawak – Bako National Park: Brunig 7662, Carrick & Enoch 34, Chai & Paie 17850, Hou 537 and 545, Purseglove 4895, 5006, 5536, 5543; Stone 6854, 13418; Baram District, Senada 4104; Berakas For. Res.: Anderson 4873; Kalaka: Haviland sn on 24 April 1893; Kerengga Padang: Carrick 1488; Kuching: Haviland 68, =177, 2203, =2203, (=2203)Y, sn on 17 May 1893, sn on 23 May 1893; Lambir Hills For. Res.: Dan 4375; Limbrang: Haviland 2202, 2291 (2202); Lokapas Kudat: Orolofo: 18251; Merintaman For. Res., Sipitang: Lantoh 72326; Miri: Luang 24141. Luang & Paie 24737; Naman For. Res., Sibu: Sanusi 5327; Rejang River: Haviland & Hose 3636; Sabal For. Res.: Paie 17031; Samapdi For. Res.: Paie 26180, 26926; Sungei Pirian Lundu: Chai 18523; Tanjong Po: Brooke 10640; Triso, Simanggang: Anderson 12852; exact location unknown: Beccari 700, 742, 1962, 3141, 3275, 3363; Lave sn; Native collector 97, 307, 550.

Kalimantan – Bengkoka: Balajadia 2841, Shea & Minjulu 76132; Doessoen Lands: Korthals sn (*Ewyckia latifolia* Bl. var. *membranacea* Bl., holotype L); Gunong Pamatton: Korthals sn (*Ewyckia latifolia* Bl., holotype L); E. Kutei: Kostermans 5429; W. Koetai: Ender 1545; Loa Dajanan, Samarinda: Kostermans 6706; Lubak Duaya: Meijer 23636; Maslhi For. Res.: Krukoff 4021; Mensalong: Melegrito 2506; Mt. Kenepai: Hallier 1630; Nunukan Island: Kostermans 9021, 9128; Meijer 2366; Pembilangan: Amdjah 804; Sam Pajau: Aet 661; Samarinda: Reksodihardjo 101; Sampit: Kostermans 4709; Soengai Kenepai, Hallier 2159; Sungei Menubar: Kostermans 5083; Sungei Susuk: Kostermans 5637; Tapang Padai: Omar 68; Tarakan Island: Meijer 2469; exact location unknown: Winkler 2249, 2408.

Celebes – Manado: Eyma 3399, 4020; Moena: Neth. Ind. For. Serv. 21607.

Moluccas – W. Ceram: Kuswata & Soepadmo 212; Soela Island: Neth. Ind. For. Serv. 28834, 29817; sine loc.: Zippel sn (*Ewyckia cyanea* Bl., holotype L).

New Guinea – Babo: Aet 690; Beriat: Schram 6007; Versteegh 4900; Daswa: Brass 5959; Hollandia: Neth. Ind. For. Serv. 5715, 25715; Ingembit: Henty, Ridsdale, Galore 31810; Ridsdale, Henty, Galore 31929; Reksodihardjo 291, 343; Job Is.: Schram 14915; Laem Morobe: Hartley 11913; Oriomo River: McVeigh 8292; Sepik-Gebiet: Ledermann 6536; 7788; Sidai: Koster 6784; Schram 1743; Sorong: Pleyte 704; Wersar: Versteegh 4969; sine loc.: Ledermann sn (*Memecylon oligoneuron* Bl. var. *maluense* Mansf., isotype ? SING) (Ledermann 7007, type, not seen).

Australia. Queensland – Bamaga, Torres Strait: Hyland 3990.



Plate 2. *Pternandra coerulescens* Jack. *Ewyckia paniculata* Miq. is based on a specimen with an abnormal (witches broom) inflorescence described by Miquel in 1860 which Triana renamed as *Pternandra paniculata* (Miq.) Triana in 1871. Bentham provided the name *Pternandra paniculata* Benth. in the Wallich Catalogue (no. 4080) in 1831 which was not validly published until 1879 by Clarke as *P. paniculata* Benth. ex C1. King reduced this species to a synonym of *P. coerulescens* Jack in 1900, while Ridley considered *P. paniculata* a synonym of *P. griffithii* King (= *P. tuberculata* (Korth.) Nayar). King's opinion has been confirmed in this revision. This is the holotype of *Ewyckia paniculata* which was collected by Teysmann on Bangka Island in 1871. Photo: Rijksherbarium, Leiden.

6. *Pternandra coriacea* (Cogn.) Nayar, Bull. Bot. Survey India 17 (1978) 53. *Kibessia coriacea* Cogn. in DC., Monogr. Phan. 7 (1891) 1109; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 450.

Tree up to 10 m tall with a diameter up to 60 cm. Bark smooth, thin, dark brown; inner bark yellowish; sapwood light brown; heartwood dark brown. Branchlets slightly flattened, becoming cylindrical, 1–1.5 mm thick, epidermis dark brown, flaking and peeling off leaving a smooth, tan coloured surface. Blades subcoriaceous, glabrous, elliptic to ovate, acuminate at the tip (acumen c. 5 mm long), acute to somewhat rounded and decurrent (1–2 mm) at the base; 3-nerved from the base, nerves sunken above, prominently raised and tapering below; intramarginal nerves frequently appearing as a second set of basal nerves (thus 5-nerved), but thinner and parallel, 1–1.5 mm away from the margin; secondary venation pinnate from the 3 main nerves, c. 20 pairs, anastomosing and reticulate; 4.5–6.5 cm long, 2.5–4 cm wide; glaucous below when fresh; drying dark brown to olive-green above, grey-whitish or grey-greenish to light brown below. Petioles flattened, 2–5 mm long, 1–1.5 mm wide, glabrous. Inflorescences from leaf axils, composed of solitary flowers and or 3-flowered cymes, up to 1.5 cm long; axes obscurely 4-angled to cylindrical, glabrous. Bracts and bracteoles lanceolate, acute, c. 1 mm long. Primary axes solitary or clustered, 2–4 mm long, with 1 or 2 nodes; secondary axes not developed in solitary flowers, in the cymes 3–4 mm long, pedicels 2–3 mm long in the cymes, 5–8 mm long with solitary flowers, usually puberulous. Calyx tube campanulate, 4 mm long, 3 mm wide, covered with entire, glabrous projections which are umbonate to tuberculate in the lower part, longer and more echinate near the margin; cap conical, acuminate, smooth, glabrous, 4–5 mm long, 3–4 mm wide, falling off in one piece. Petals broadly ovate, 7–8 mm long, 6–8 mm wide, thin, white to very pale mauve, reflexed at maturity. Filaments flattened, 3–3.5 mm long; anthers usually with a small extension of the connective near the filament, 2–2.5 mm long. Stigma subcapitate to cylindrical, grooved, c. 1 mm long. Style slender, 7–9 mm long. Fruits urceolate, with a tessellate to triangular-echinate pattern, 7–8 mm long, 6–7 mm wide, green then turning purple when ripe. Seeds numerous, flattened, quadrangular-cuneate, smooth, glossy tan coloured, c. 1 mm long.

Habitat: lowland swamp forests, peat swamps
Vernacular: ubah pandang (Malay)

Pternandra coriacea (Cogn.) Nayar is easily distinguished from all other species by its relatively small, glaucous blades; solitary and short inflorescence axes; and the umbonate to triangular calyx scales which are never barbed.

Pternandra teysmanniana (Cogn.) Nayar differs from *P. coriacea* in having thick coriaceous, 5-nerved blades with an obtuse to rounded tip, and fascicled to subsessile flowers. *P. coriacea* is in many respects similar to *P. tuberculata* (Korth.) Nayar in leaf size and texture, inflorescence, calyx pattern, and fruits. *P. tuberculata*, however, has a calyx cap which splits into 4 lobes and leaves which often become considerably larger than any collections of *P. coriacea* that I have seen. *P. rostrata* (Cogn.) Nayar differs in having thicker inflorescence axes, larger flowers with an acute to rostrate cap, and larger leaves.

P. coriacea is only known from Borneo and is apparently a relatively rare species. More collections are desired in order to understand this species more completely.

Fig. 7. A: calyx; B: mature petal; C: stamen.

Plate 3. Lectotype of *Pternandra coriacea* (Cogn.) Nayar.

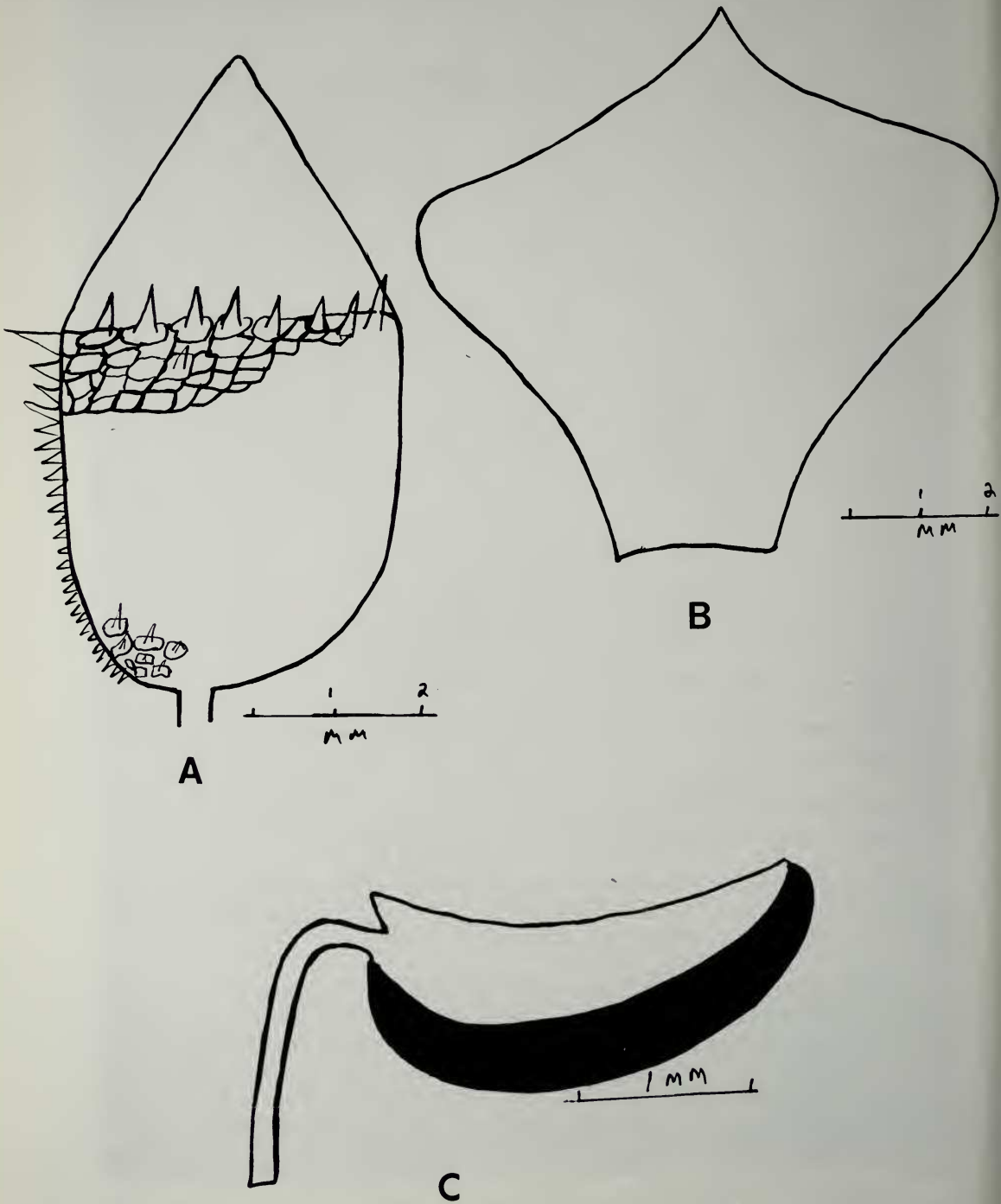


Fig. 7. *Pternandra coriacea* (Cogn.) Nayar - - A, C: Beccari 3324 (lectotype); B: Haviland (=972)B.



Plate 3. *Pternandra coriacea* (Cogn.) Nayar, lectotype at Florence. Cogniaux listed two syntypes for this species, both of which were collected by Beccari in Sarawak. This collection was chosen as the lectotype for this revision. Cogniaux queried the name "*Kibessia glauca* Triana" in his note on this specimen which, as far as I can determine, is an *in scheda* name. Photo: Rijksherbarium, Leiden.

Distribution:

Borneo. Sarawak — Garai: Haviland sn (548) in 1891; Kuching: Haviland =972B, 1753; Lake Kwang: Forest Department Sarawak 2606; Marop: Beccari 3164 (syntype FI), 3324 (lectotype FI, isolectotypes K, P); Naman For. Res., Sibü: Ahmad 14335, Anderson 3361/3; Sungei Mas: Bujang 20878.

Brunei — Liang: van Niel 4621; Ulu Sigei: Brunig 1006.

7. *Pternandra crassicalyx* Maxw., sp. nov.

Ramuli cylindrici, furfuracei, epidermide in sicco brunnescenti, deglubenti. Folia subcoriacea oblonga rarius elliptica 75–150 mm longa, 30–75 mm lata, acuminata, basi sive acuta, secus que petiolum decurrente, sive rotunda, supra fusciscentia usque nigrescentia, infra (sicco) brunnescentia, subtriplinervis, nervis furfuraceis, glabrescentibus, intramarginalibus tenuioribus; petiolis 40–60 mm longis furfuraceis glabrescentibus. Inflorescentia axillaris, terminalisve, 15–40 mm longa, rhachi floribus solitariis vel 3-umbellatis, quadrangularibus vel cylindricis, furfuraceis. Bractee lanceolatae, 15–50 mm longae acutae. Pedicelli 2–3.5 mm longi. Calyx late campanulatus tessellatus vel umbonatus 6 mm longus, 8 mm latus, 1.5 mm crassus, furfuraceus; calyptra tholiformis glabra laevis 7 mm longa, 1.5 mm crassa, tota integre decidua. Petala in alabastro crassa, late rhombica, 6 mm longa, 8 mm lata, acuta. Fructus campanulatus truncatus, pericarpio 1.5–2 mm crasso.

Type: SARAWAK: Kapit, Bukit Raya, Au 23944 (L, holotype; isotypes: K, SING, SAN, A, BO, KEP, MEL, MOSC, FHO, CGE, P, SAR). Fig. 8.

Tree 5–12 (23?) m tall, diameter up to 15 cm. Bark smooth, soft, light grey-green or light to dark brown, often mottled; inner bark thin, red, cambium red, sapwood white to yellow-pink. Branchlets slightly flattened below the upper node, cylindrical below, epidermis drying dark brown, nearly glabrous or minutely brown furfuraceous, usually peeling off on the second internode leaving a smooth, glabrous, grey-khaki surface when dry, 1.5–2 mm thick; nodes slightly swollen. Blades subcoriaceous, oblong, less frequently elliptic, acuminate at the tip (acumen up to 1 cm long), somewhat rounded or acute and decurrent at the base; 3-nerved from the base, nerves sunken above, raised and tapering below, intramarginal nerves thin, c. 1 mm from the margin, disappearing in the upper part of the blade; secondary venation pinnate from each main nerve, c. 15–20 pairs, anastomosing and reticulate; glabrous above, glabrous or red-brown furfuraceous on the nerves below; 7.5–15 cm long, 3–7.5 cm wide, drying dark brown to blackish, frequently with a greyish hue, above; brown below. Petioles 4–6 mm long, 3 mm wide, glabrous or red-brown furfuraceous. Inflorescences from leaf axils or terminal, 1.5–4 cm long; flowers solitary or in 3-flowered umbels; axes slightly 4-angled to cylindrical, red-brown furfuraceous. Bracts and bracteloes lanceolate, acute, 1.5–5 mm long, red-brown furfuraceous. Primary axes solitary (3) 8–22 mm long with 1 or 2 nodes, 0.5–1.5 mm thick at the base; secondary axes not developed in solitary flowers, or up to 5 mm long, pedicels 2–3.5 mm long. Calyx campanulate, with a tessellate to umbonate pattern of scales which are smaller near the pedicel and longest about the margin, minutely furfuraceous, mature buds 6 mm long, 8 mm wide, 1.5 mm thick, purple; cap dome-shaped, smooth, glabrous, 7 mm long, 1.5 mm thick, falling off in one piece, pale pink. Bud petals imbricating to the right, broadly rhombic, acute and often asymmetric at the tip, truncate at the base, thick with thinner margins where the venation is visible, 6 mm long, 8 mm wide, light violet, light blue, to purple. Filaments in bud c. 2 mm long, flattened,

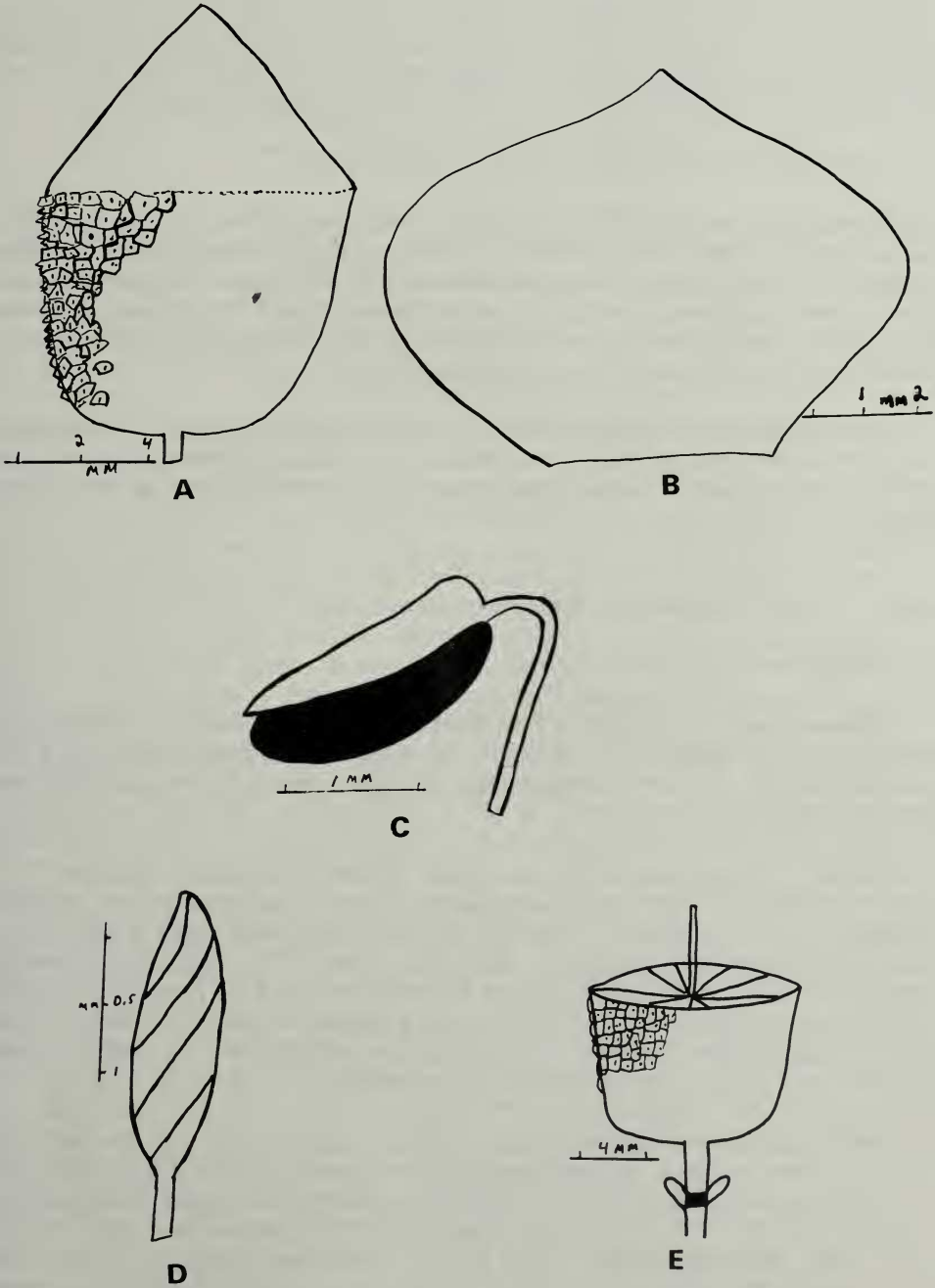


Fig. 8. *Pternandra crassicalyx* Maxw. - - A: Au 23944 (holotype); B, C, D: Wright & Othman 32303; E: Ampuria 32707.

white; anthers in bud c. 2 mm long, connective with a minute spur near the filament. Stigma in bud cylindrical, twisted to the right, 2.5 mm long, very light violet when mature; style slender, 4 mm long in bud. Mature fruits campanulate, truncate, 9–10 mm long, 10–12 mm wide, with a tessellate to umbonate pattern, scales often widely spaced, margin truncate, areolus c. 7 mm wide, internal lines distinct, stigma often persisting, epidermis red or violet, drying dark brown; pericarp 1.5–2 mm thick, gritty. Seeds numerous, flattened, quadrate-cuneate, c. 0.75 mm long, glossy tan coloured.

Vernacular: sireh-sireh, siri siri; puloh (Iban), empulis (Iban).

Pternandra crassicalyx Maxw. is readily distinguished from all other species of *Pternandra* by its large, thick, tessellate to umbonate calyx tube; large, thick, and smooth cap; and the thick pericarp. *Pternandra tuberculata* (Korth.) Nayar has generally smaller, glabrous leaves and flowers, and a calyx cap which splits into 4 lobes. *Pternandra rostrata* (Cogn.) Nayar has similarly shaped fruits, however the calyx and fruit patterns are umbonate to tuberculate; with a thinner, more acute cap.

The red-brown indumentum on the branchlets, blades (only in some specimens), and inflorescences recall that of *P. hirtella* (Cogn.) Nayar, however the latter differs greatly in having setose, branched calyx appendages; a setose cap, and entirely different fruits.

Fig. 8. A, calyx; B: mature petal; C: stamen; D: stigma; E: fruit.

Distribution:

Borneo. Sabah — Beaufort: Mikil 28089; Beaufort Hill: Madius 49299; Keningan District, Crocker Range: Ag. Nordin 85971; Kinabakan District, Tangkulap Kechil: Madani 33239; Mt. Kinabalu: Chew, Corner, Stainton 7; Papar: Lajangah 32197; Tawau District, Kalabakan: Gibot 30582.

Sarawak — Baram District, Entyout River: Hose 396; Batanson: Ampuria 32707; Bintulu, Ulu Segan: Wright 27967; Bukit Iju: Jugah 23701; Bukit Raya, Kapit: Au 23944 (holotype L, isotypes: K, SING, SAN, A, BO, KEP, MEL, MOSC, SAR, FHO, CGE, P). Chai 18919, Wright 24713; Kota For. Res.: Chai & Paie 27931; Limbang, Ulu Medamit: Wright & Othman 32303; Long Kerangan: Tong 35020; Long Palu: Fuchs 21214; Milinau Gorge: Chew 437; Mt. Tawai For. Res.: Dewol & Alxius 88399; Miri — Nyabau: Luang 24557; Pelagus Rapids For. Res.: Anderson & Hou 502; Temburong, Bangar: Ashton 492; Ulu Singei Salimpupon: Bakar 26859, Dan 26859.

8. *Pternandra echinata* Jack, Mal. Misc. 2:9 (1822) 3; King, J. As. Soc. Bengal 69, II:1 (1900) 69 (Mat. Fl. Mal. Pen. 3, 477); Ridley, Fl. Mal. Pen. I (1922) 809; Corner, Way. Trees Mal., ed. 2 (1952) 452 and fig. 149; Keng, Gard. Bull. Sing. 31 (1978) 110. *Ewyckia echinata* (Jack) Walp., Repert. Bot. Syst. 5 (1846) 724. *Pternandra echinata* Jack var. *pubescens* (Decne.) King, l.c. 70 (l.c. 478); Craib, Fl. Siam. Enum. I:4 (1931) 702, *syn. nov. Kibessia pubescens* Decne., Ann. Sci. Nat. 3:5 (1846) 318; Triana, Trans. Linn. Soc. 28 (1871) 152; Clarke in Hk. f., Fl. Brit. India II (1879) 552; Cogniaux in DC., Monogr. Phan. 7 (1891) 1108. *Pternandra echinata* Jack var. *bracteata* Ridl., l.c. 809, *syn. nov. Kibessia echinata* (Jack) Cogn., l.c. 1108; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 451. *Kibessia acuminata* Decne., l.c. 316; Triana, l.c. 153; Cogniaux, l.c. 1108;

King, l.c. 70 (l.c. 478) *pro syn.*; Bakh. f., "Thesis" (1943) 319, Med. Mus. Bot. Utrecht 91 (1943) 319, Rec. Trav. Bot. Neerl. 40 (1943–45) 319. *Pternandra acuminata* (Decne.) Nayar, Bull. Bot. Survey India 17 (1978) 52. *Kibessia cupularis* Decne., Deles. Ic. Pl. V (1846) tab. 5 and l.c. 317. *Kibessia simplex auct. non* Korth.: Blume, Mus. Bot. Lugd.-Bat. I:1 (1849) 9; Triana, l.c. 152; Clarke, l.c. 552; Cogniaux, l.c. 1108; King, l.c. 70 (l.c. 478). *Kibessia angustifolia* Bl., l.c. (1849) 9; Walpers, Ann. 2 (1850–51) 611; Miquel, Fl. Ned. Ind. I (1855) 571; Triana, l.c. 153; Cogniaux, l.c. 1109; Merrill, l.c. 450 (aff.).

Tree up to 20 m tall with a diameter (dbh) up to 60 cm, bole straight, infrequently a shrub or climber (probably incorrect). Bark smooth, finely fissured, thin; grey, yellow-brown, brown-grey, brown-black; inner bark brown, red, orange; wood yellow, white. Branchlets distinctly and often sharply 4-angled or slightly 4-winged, becoming cylindrical with age; nearly glabrous to densely, but minutely, pilose with red-brown, less commonly light yellowish, hairs; becoming glabrous or not with age; 1.5–2.5 mm thick; nodes slightly thicker, with a distinct interpetiolar, stipule-like ridge in an inverted "U"-shape and uniting the angles on the internodes, becoming thickened with age. Blades thin, lanceolate to elliptic, acuminate at the tip (acumen 1–1.5 cm long) narrowed and decurrent for a few mm or somewhat rounded at the base; 3-nerved from the base, nerves sunken above, raised and tapering below; intramarginal nerves very faint, 0.5–1 mm from the margin, looping; secondary venation pinnate from each main nerve, anastomosing and reticulate; glabrous above, glabrous to densely, but minutely (especially on the 3 main nerves) pilose with red-brown, less frequently light yellowish, hairs; 7–12 cm long, 2.5–4.5 cm wide; dark green above, green to green-brown below; drying brownish to dark olive-green above, lighter brown to light olive-green below. Petioles flattened and grooved, 3–6 mm long, 1 mm thick; glabrous to densely, but minutely pilose as the branchlets and blades. Inflorescences varying from solitary flowers to cymes with 3–9 flowers (i.e. umbel with 3 flowers or simple cyme with 5–9 flowers), (2)3–6 cm long, from leaf axils and often terminal; axes quadrangular, sparsely to densely pilose as described above with the branchlets, etc., 1–1.5 mm thick; green, drying brown or tan; primary axis solitary, 1–2 cm long with 2–3 nodes; secondary axes not developed, thus the flowers are solitary; or present as 3 axes, each with one flower, i.e. appearing as an umbel, or cymose with the middle axis having tertiary axes, each with one flower (inflorescence 5-flowered); 1–1.5 mm long; maximum development as a 9-flowered inflorescence with each secondary axis having 3 tertiary axes, each terminated by one flower; tertiary axes 7–14 mm long; pedicels 4–8 mm long. Bracts of the inflorescence and individual ramifications extremely variable in size, ranging from linear-lanceolate-ovate to elliptic-broadly ovate; generally acute to acuminate at the tip, narrowed at the base, distinctly 3-nerved, thin, glabrous to pilose as the branchlets, leaves, etc.; 5–20 mm long, 2–9 mm wide, green, drying dark brown or olive-greenish; persisting in fruit. Calyx tube campanulate, acutely tuberculate near the pedicel, becoming echinate near the margin with triangular, obtuse to acuminate appendages, 2–5 mm long, frequently twisting or curling; minutely papillose throughout; tube 6–7 mm long; 7–8 mm wide, smooth internally with 16 slightly raised lines opposite and alternating with the filaments, green; calyx cap acute to acuminate, 6–8 mm long, 6–8 mm wide at the base, usually minutely papillose throughout, green; falling off as a unit with the expansion of the petals. Petals thick, broadly ovate to oblong, truncate to broadly rounded with an acute to acuminate cusp at the tip; broadly narrowed at the base; 5–13 mm long, 3–9 mm wide, erect to spreading at maturity, blue, whitish-lilac, white. Filaments thick, flattened with a slightly raised ridge on one side, c. 2 mm wide, 3–4 mm long, whitish-lilac; bud anthers introrse, i.e. dorsal surface facing the style, later becoming horizontal, i.e. dorsal surface facing the style, later becoming horizontal, i.e. dorsal surfaces in a flat plane 90°

to and encircling the style, later becoming erect, i.e. dorsal surfaces and locules parallel to the style; subreniform, at first with the flap-like margins of the connective near the filament folded down, later becoming erect forming a flat, ovate, obtuse crest, 1–1.5 mm long; without other projections; 3–3.5 mm long, 2–2.5 mm wide; connectives yellow, locules reddish. Stigma cylindric, often slightly twisted to the left, 2.5–5 mm long, c. 1 mm thick, persisting in fruit, yellowish. Style 5–9 mm long, whitish. Fruits subglobose (slightly wider than high) or globose, 7–10 mm high, 8–15 mm wide; areolus 6–9 mm diameter, internal ridges obscure to distinct; appendages on the calyx tube, especially near the margin, up to 9 mm long; epidermis green and turning pale yellow, purplish when ripe, brown-tan when dry; pericarp 1–1.5 mm thick, gritty. Seeds numerous, flattened, rhombic-quadrangular, c. 0.75 mm long, testa glossy tan.

Habitat: primary and secondary forests

Vernacular: kayu kaki kura (Temuan in Selangor), lemak ketam (Kedah), pako anun and sial-mi-na-on (Malacca), mempoyan and serri menwan (Pahang), sial menaon and sial menahun, cursed shade (Selangor and Pahang).

Pternandra echinata Jack is easily distinguished from *P. tuberculata* (Korth.) Nayar by the former having larger flowers and fruits, minutely pilose branchlets and undersides of the chartaceous blades, and the distinctly echinate appendages near the margin of the calyx tube in both flower and fruit.

In addition to obvious differences in flower morphology, *P. azurea* (Bl.) Burk. has similar branchlets which, however, tend to crack and peel at the angles leaving a sinuate-alate appearance, and less pubescent baldes.

King notes that *P. echinata* has a truncate calyx with 4 narrow, acuminate teeth. All the specimens with flowers of this species in the Singapore collection, including some that he collected himself in Singapore, have a distinct calyx cap, or in those specimens where the cap has fallen off and in fruiting specimens, the calyx tube is truncate and without any teeth. It is possible that King mistook some of the external, echinate appendages for calyx lobes.

Other authors have not agreed on the exact status of *P. echinata* Jack. The species was considered a synonym of *K. azurea* (Bl.) DC. by Moritzi (in Zollinger's Syst. Verz. (1845–46) p. 11), and identical to *K. simplex* Korth. by Cogniaux (Boerlage, Handl. Fl. Ned. Ind. I (1891) 1108). Burkill (Kew Bull. (1935) 319) considered the species as being *P. azurea* (Bl.) Burk. Bakhuizen f. (1943, 1943–45) was of the opinion that *P. echinata* Jack is allied to *P. coerulescens* Jack and that the former "is an up to now unknown species of that genus." Finally, Merrill (J. Arn. Arbor. 33 (1952) 241) suspected that the species is *K. azurea* (Bl.) DC.

After having examined specimens of these species and having seen living material of *P. echinata* it is quite apparent that the description of *K. acuminata* Decne. corresponds with *P. echinata*. It is certain that *K. acuminata* is not the same as *K. azurea* (Bl.) DC., *K. simplex* Korth., or *P. coerulescens* Jack. Clarke (Fl. Brit. Ind. II (1879) 552) and Cogniaux list specimens collected by Walker (304) and Maingay (804) (both from Singapore) as representative of *Kibessia acuminata* Decne. Both specimens are unquestionably *P. echinata*. King also notes that *K. acuminata* is not distinct and subsequently reduced it to *P. echinata*. I fully agree with his treatment. Bakhuizen f. considered *K. acuminata* Decne. as a distinct species and listed two collections after his description viz. Bunnemeyer 6424, which is *P. echinata*, and Hallier 3113, which is *P. azurea* (Bl.) Burk. var. *azurea*.

There is considerable justification, therefore, in assuming that Jack's short description: "pedunculis axillaribus terminalibusque, calyxibus ovariisque echinatus" matches the most salient characteristics — the echinata calyx tube — of the specimens that I have identified as *P. echinata* Jack.

Kibessia cupularis Decne. in Delessert's Icones is identical to *P. echinata*, thus confirming the opinions of Cogniaux and King on the synonymy of the former with the latter species.

I have not hesitated to reduce *P. echinata* Jack var. *pubescens* (Decne.) King to a synonym of *P. echinata* Jack since the pubescence of the branchlets, leaves, and axes of the inflorescences vary considerably. No distinction can be made between those specimens that are glabrous or slightly pilose and those which have "much minute rusty pubescence". King also had his doubts about the distinction of this variety and comments that Wallich did not accept this variety and considered it as being "true" *P. echinata* Jack.

Ridley designated *P. echinata* Jack var. *bracteata* Ridl. on the basis of "large, ovate-lanceolate, persistent bracts". Indeed, there are several specimens, in addition to the types of the variety (Ridley, sn, from Bukit Panjang, Singapore), e.g. Spare 1045, King & Jumali 6298, Maxwell 76–757; that have these kind of bracts. However, some of the older collections including, King s.n. (Singapore, 7 September 1879), Curtis 270, Hullett 661, and Ridley 9189 have bracts similar to the isotype. In fact, Curtis 270 is annotated "*P. echinata* var. *pubescens* King". Considering the fact that there are specimens with either intermediate sized bracts (Goodenough 2010 from Singapore, and Lambok 2723 from Rompin, Pahang) or have both small and large bracts on the same specimen (often the same inflorescence) (C. F. Kedah 20788 from Gunong Jerai, Kedah; Santiago sn, from Kepong; and I. H. Burkill 446, from Malacca) it is quite possible that King did not consider the larger bracts as being unusual. His description merely indicates "... flowers with one or more pairs of curved, linear-oblong bracteoles". Both Ridley and Bakhuizen f. did not include descriptions of the bracts of this species, thus I am uncertain of the size limits for the typical variety.

I feel that there is no good reason to maintain var. *bracteata* Ridl. as distinct from the typical variety of *P. echinata* Jack since there are some specimens that cannot be definitely distinguished. As far as all other structural and vegetative features are concerned, var. *bracteata* does not differ from those specimens with small bracts.

It is interesting to note that all specimens of *P. echinata* Jack from Singapore and most of the collections from Johore have large bracts. Specimens from southern Thailand to Johore mostly have smaller bracts. Craib does not record var. *bracteata* Ridl. for Thailand. It is not surprising, therefore, that four of the specimens with intermediate or mixed-sized bracts come from north of Johore and the other from Singapore since the centers of distribution probably include the northern part of the Malay Peninsula for small bracts and Singapore — Sumatra for large bracts. Ridly also notes that the distribution of var. *bracteata* includes Singapore, Sumatra, and Java, however I have not seen any specimens of this species from the latter locale. It is probable that *P. echinata* may be found in Sumatra.

The holotype of *Kibessia? angustifolia* Bl. at Leiden (Waitz s.n., from Borneo) merely consists of a short branch and a few leaves. These branches are 4-angled and the blades are thin and narrow. These parts differ from *P. echinata* in being entirely glabrous, otherwise they are indistinguishable. This species is not, as Bakhuizen f. claims, the same as *P. coerulescens* Jack.

Fig. 1. Ovary, x-section.

Fig. 9. A: inflorescence and leaf; B: flower; C: mature petal; D: mature stamen.

Plate 4. A and B: flowers; C: branchlet with mature fruits; D: mature trunk and bark.

Distribution:

Thailand. *Nakorn Sithammarat*, Thung Song: Geesink & Santisuk 5362; *Trang*, Khao Chong: Phusomsaeng 58; *Satun*, Klawng Ton: Kerr 14575; *Songkla*, Klawng Yai: Kerr 15884; *Pattani*, Betong: Kerr 7430; *Narathiwat*, Waeng: B. Sangkhachand 853; Toh Moh, Kao Re Chaw: Lakshnakara 737.

W. Malaysia. *Kedah* — Bukit Perak For. Res.: Chan 13137; Gunong Bongsu For. Res.: Spare 3775; Gunong Jerai: Meh 10159, Everett 13672; *Kedah*: Meh 21884; Ulu Mada For. Res.: Chan 6732.

Penang — Curtis 270, = 270 in Sept. 1890 and March 1892; Ridley sn on 9 July 1890; Wallich Cat. 4078 (neotype K), 4078A (*P. echinata* Jack var. *pubescens* (Decne.) King, lectotype K).

Perak — Gunong Bubu For. Res.: Everett 13962, Suppiah 11933; *Larut*: King's collector 3518, 3578; Chan 13195, Everett 13581 at Maxwell's Hill; *Taiping*: Wray 2354; sine loc.: Kunstler 87; Scortechini 1643, 1894 (1824?).

Kelantan — Kampong Gobek: Shah & Kadim 565; *Kuala Lebir*: Ridley sn in Feb. 1917; *Sungai Jenal*: Cockburn 7446; *Sungai Lebir Kechil*: Cockburn 7138.

Trengganu — Bukit Langut For. Res.: Suppiah 11430; *Bukit Rambai*: Loh 13418.

Selangor — Batu Tiga: Mahamet sn in April 1890; Berembun near Bukit Tangga: Ismail 104877; *Bukit Kulu*: Goodenough 10604; *Bukit Lassong* For. Res.: Kochummen 93466; *Kepong*: Ng 118166, Santiago sn; *Klang Gates*: Hume 7077; *Petaling Jaya*: Woods 145; *Rawang*: Kloss sn; *Semangkok*: Ridley sn; *Sungei Buloh*: H. M. Burkill & Shah 1033, 1095; *Ulu Gombak*: Carrick 1482 (2412), Hume 8873; *Ulu Langat*: Gadoh Umbai 880, 1361, 1769; *Weld's Hill*: Cubitt 811.

Pahang — Benka Road: Soh 15089; *Chini* For. Res.: Bray 11632; Everett 14559; *Gunong Benom*, *Ulu Krau*: Ismail 97845; Whitmore 3153; *Gunong Tapis*: Cockburn 10907; *Lepar* For. Res.: Suppiah 108979; *Lubok Paku*: Ngadiman 16122; *Raub*: I. H. Burkill & Haniff 16241, 16868; *Sohadi* 14715; *Rompin*: Lambok 2723; *Taman Negara*, *Latah Berkoh*: Keng, Wee, & students 3; *Sungei Tahan*: Kiah 31912; *Tahan Woods*: Whitmore 4788; *Taman Negara*: Everett 14456; *Shah & Shukor* 2672; *Ulu Tembeling*: Henderson 22130.

Negri Sembilan — *Bukit Taugga*: Nur 11831; *Gunong Angsi*: Sohadi 14585; *Gunong Tampin*: Ridley sn on 16 Jan. 1917; *Jelebu* For. Res.: Suppiah 11297; *Johol*: Ridley sn on 18 Jan. 1917; *Kuala Klawan*: Franck 1129; *Menyala* For. Res.: Ng 1822; *Hou* 728; *Tampin* For. Res.: Shing 17057.

Malacca — *Batang*: Derry 17; *Bukit Bruang*: Curtis =270 in May 1900, Goodenough 1346; *Bukit Sedaman* For. Res.: Holtum 9672; *Kesang Batu*: Hervey 2010b; *Selundun*: Alvins 249; *Sungei Baru* For. Res.: I. H. Burkill sn on 13 Feb. 1914; *Sungei Ujong*:

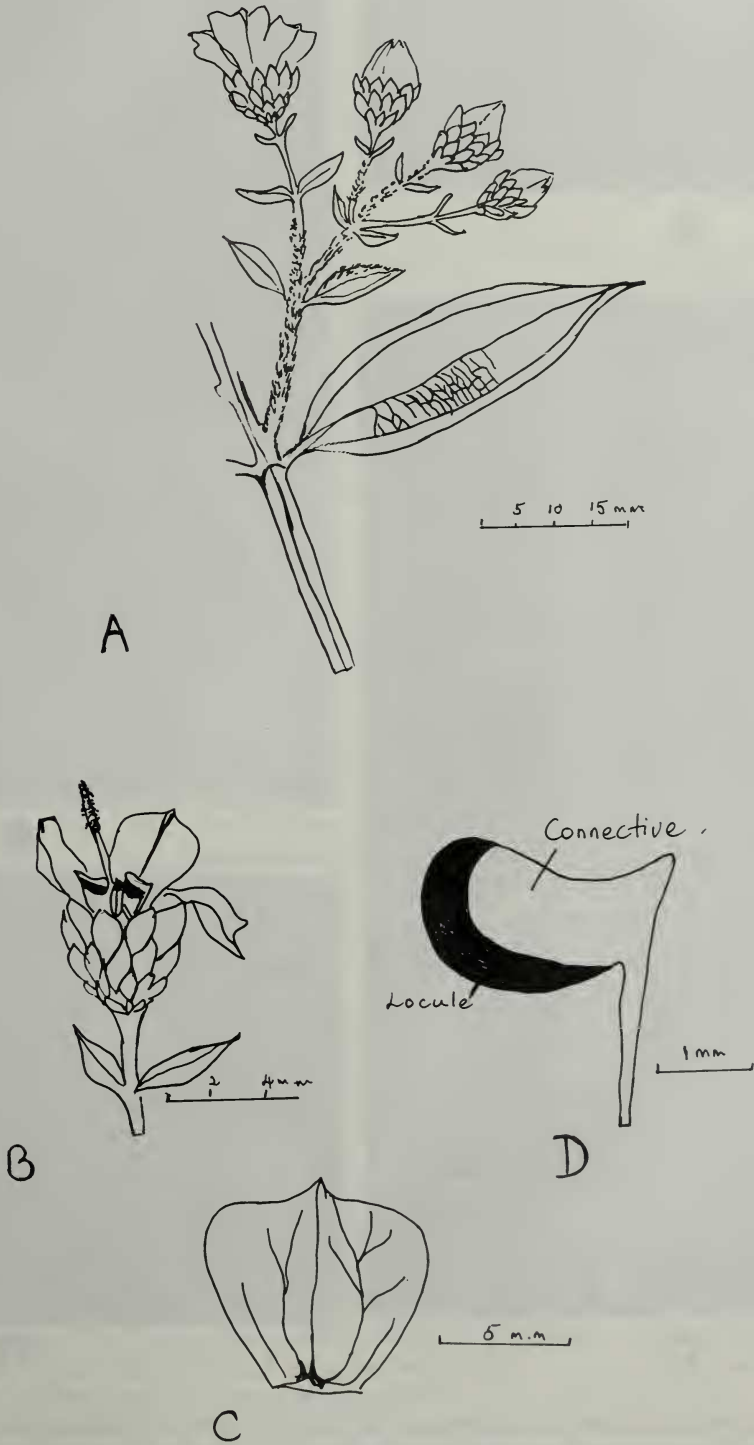


Fig. 9. *Pternandra echinata* Jack - - A: I. H. Burkill & Haniff 16808; B, C, D: Maxwell 76-757.



A



B



C



D

- Plate 4. *Pternandra echinata* Jack A: flower, front view; B: flower and bracts, side view; C: branchlet with mature fruits; D: mature trunk with bark. Photo A taken at the Botanic Gardens "Jungle" on 11 January 1981; B and C from Maxwell 76-757 collected at the Bukit Timah Nature Reserve, Singapore on 7 December 1976; and D at the Bukit Timah Nature Reserve on 14 September 1980. Photos: A, Hugh Tan; B and C, Douglas Teo; and D, Dr. Chang Kiaw Lan. Scales in cm.

Alvins 2148; sine loc.: Alvins 586, 727, 1246, sn; Cuming 2337; Griffith 2272, sn; Maingay 803 (1213).

Johore – Bukit Pakat: Ridley sn in 1900; Bukit Tangga Tujoh: Shah, Ahmad, Noor, 2057; Castlewood: Ridley 9189; Endau: Singh (& Samsuri) 1028; Gunong Lambak: Whitmore 15547; Gunong Panti: Bain 6015, Chan 17667; Gunong Pulau: Maxwell (observed); Kota Tinggi: T. & P. 648 (3248); Kuala Palong For. Res.: Everett 14272; Mt. Ophir: Shah & Ahmad 3658; Pulau Tinggi: I. H. Burkill sn in June 1915; Dungei Tukong Estate: Spare 1045.

Singapore – Anderson 62; Cantley 184, 2900; Goodenough = (Ridley) 352, 2010; Gilliland 5075; Hardial 624; Henderson 1372; Hullett 661; Kasim 577; Keng & Jumali 522, 3071 (K242), 6298; King sn on 7 Sept. 1879; Maingay 804 (3333); Maxwell 76–757; Panki 769; Ridley 352, sn at Bukit Panjang (*P. echinata* Jack var. *bracteata* Ridl. (holotype K, isotype SING); Walker 304; Botanic Gardens: Noor sn on 26 April 1921, Nur sn on 24 April 1924 and 19 Nov. 1929, Furtado sn on 19 Nov. 1929, Desmakh sn on 10 Sept. 1921; Hill 1103; Ahmad 1442; Ali sn at Bukit Timah on 18 April 1974.

Riouw Archipelago. Pulau Dompok: Bunnemeyer 6424.

Borneo. sine loc.: Waitz sn (aff.) (*Kibessia angustifolia* Bl., holotype L).

9. ***Pternandra galeata*** (Korth.) Ridl., Fl. Mal. Pen. I (1922) 808. *Ewyckia galeata* Korth. in Temm., Verh. Nat. Gesch. (1844) Bot. 254 and tab. 67; Miquel, Fl. Ned. Ind. I (1855) 569. *Rectomitra galeata* (Korth.) Bl., Mus. Bot. Lugd.-Bat. I:1 (1849) 6 and fig. 1; Naudin, Ann. Sci. Nat. 3:18 (1852) 261; Triana, Trans. Linn. Soc. 28 (1871) 153. *Kibessia galeata* (Korth.) Cogn. in Boerlage, Handl. Fl. Ned. Ind. I (1890) 537 (*nomen*) and in DC., Monogr. Phan. 7 (1891) 1110; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 451; Bakhuizen f. "Thesis" (1943) 320, Med. Mus. Bot. Utrecht 91 (1943) 320, Rec. Trav. Bot. Neerl. 40 (1943–45) 320. *Kibessia galeata* (Korth.) Cogn. var. *pluriflora* Mansf. in Engler, Bot. Jahr. 60 (1925) 138, *syn. nov.* *Pternandra forbesii* E. G. Baker, J. Bot. 42 (1924) suppl. no. 744, 41.

var. *galeata*

Tree 7–22 m tall with a diameter up to 30 cm. Bark smooth, pinkish to pale brown, shallowly fissured and rugose, 0.5 mm thick; inner bark pale brown, 2 mm thick; wood pale brown. Branchlets flattened at and 1–2 mm below the upper node, otherwise cylindrical, smooth, 1–2 mm thick, upper nodes 3–4 mm wide. Blades subcoriaceous to coriaceous, elliptic to ovate, acuminate at the tip (acumen 0.5–1.5 cm long), narrowed and decurrent for a few mm at the base; prominently 3-nerved from the base, veins sunken above, raised and tapering below; intramarginal nerves very faint, 0.5–1.5 mm from the margin, looping; secondary venation pinnate, distinct but faint from each of the 3 main nerves, anastomosing and reticulate; 9–14 cm long, 3.5–8 cm wide, drying brown on both surfaces in thinner blades, olive-tan in thicker ones. Petioles flattened, 3–5 mm long, 1.5–3 mm wide, shorter and broader in thicker blades. Inflorescences glomerulate, often from thickened nodes behind the leaves, c. 1 cm long, several to many-flowered; primary axes 1–5 mm long, secondary axes not developed or up to 1 mm long, pedicels usually solitary on the tip of each ultimate axis, 1–2 mm long. Bracts connate and sheathing, ovate, acute at the tip, c. 1 mm long. Calyx tube campanulate, ornamented with flat or slightly raised (tessellate, umbonate, to slightly verruculose) polygonal plates outside, smooth with 16 faint vertical lines internally, c. 4 mm long, 3–3.5 mm wide;

calyx cap dome-shaped, apiculate, splitting into 2 or 4 persistent lobes, each c. 2.5 mm long, 3 mm wide, smooth and without scales or plates on both surfaces. Petals thick, broadly ovate to suborbicular, broadly rounded and acute at the tip, tapering to a broad base, 3 mm long, 4 mm wide, reflexed at maturity, blue to pinkish-white. Anthers sub-reniform, c. 2 mm long, connective shortly spurred; filaments flattened in bud, flexed-sinuate later becoming straight, 2–3 mm long. Stigma broadly conical, 4-lobed, c. 1 mm long. Style 8–9 mm long, elongating up to 15 mm and persisting in fruit. Fruit urceolate, 5 mm long, 7–9 mm wide, narrowed in a 1–2 mm long neck above the globose body, lobes often persisting, areolus 3–4 mm wide; exocarp roughened, obscurely to distinctly tessellate, drying tan to black; pericarp c. 0.2 mm thick. Seeds numerous, linear, acute, c. 1 mm long, khaki-tan with a black ridge.

Vernacular: lidah batak, lagis pukuan hutan, kemasulan, pasoeian.

Pternandra galeata (Korth.) Ridl. var. *galeata* is easily separated from specimens of *Pternandra coerulescens* Jack with short inflorescences by the presence of a calyx cap and the 1–2 mm long neck on the fruits. *P. galeata* differs from *P. tuberculata* (Korth.) Nayar by having a shorter inflorescence and tessellate, never tubercled, calyx tube, and urceolate fruits. *P. cogniauxii* Nayar has similar fruits, but has 5-nerved, cordate blades and a tuberculate calyx tube and lobes.

According to the original description, *Kibessia galeata* (Korth.) Cogn. var. *pluriflora* Mansf. merely differs from var. *galeata* in having many flowers which are mostly in groups of 3, ovate buds, and conical calyx caps. From the specimens of *P. galeata* in the Singapore and Leiden collections, this variety is not distinct and falls within the range of variation for var. *galeata*.

It should be noted that there are one or two primary axes in variety *pluriflora* (Ledermann 8585, from New Guinea) from the leaf axils, each c. 1 mm long, with 2 or 3 secondary axes each c. 3 mm long, and pedicels c. 1.5 mm long. The ovate, acute bracts at each node are about 1 mm long and persistent. The inflorescence in this specimen has longer axes than specimens from the Malay Peninsula and Borneo. In respect to the leaves, inflorescence, and calyx pattern var. *pluriflora* resembles *P. coerulescens* Jack, however the presence of a distinct cap and lobes immediately distinguishes *P. galeata* from the latter.

The two isotypes of *P. forbesii* E. G. Baker at Leiden (Forbes 3219, from Sumatra) are unquestionably the same as *P. galeata* since the fruits are distinctly urceolate. This collection was determined as *K. galeata* Cogn. by Hallier in 1916.

Fig. 10. A: inflorescence; B: flower; C: mature petal; D: stamen; E: mature infructescence.

Distribution:

W. Malaysia *Pahang* — Auwik River: Burn-Murdoch 196; Endau, Rompin: Mahamud 15506; Piangu, Endau: Evans sn.

Johore — Sungei Sedili: Corner sn on 27 March 1932, Maxwell 78–260; Kwala Sembrang: Lake & Kelsall 4073; Kwala Tehing Tinggi: Ridley sn.

Sumatra — Bangka Island: Kostermans & Anta 111, 201; Indragiri: Buwalda 6827; Penassa Siak: Ridley 9021; Sungei Bigin Telok, Palembang: Forbes 3219 (*P. forbesii* E. G. Baker (holotype K. isotypes L)); Upper Riau, Pakanbaru: Soepadmo 29.

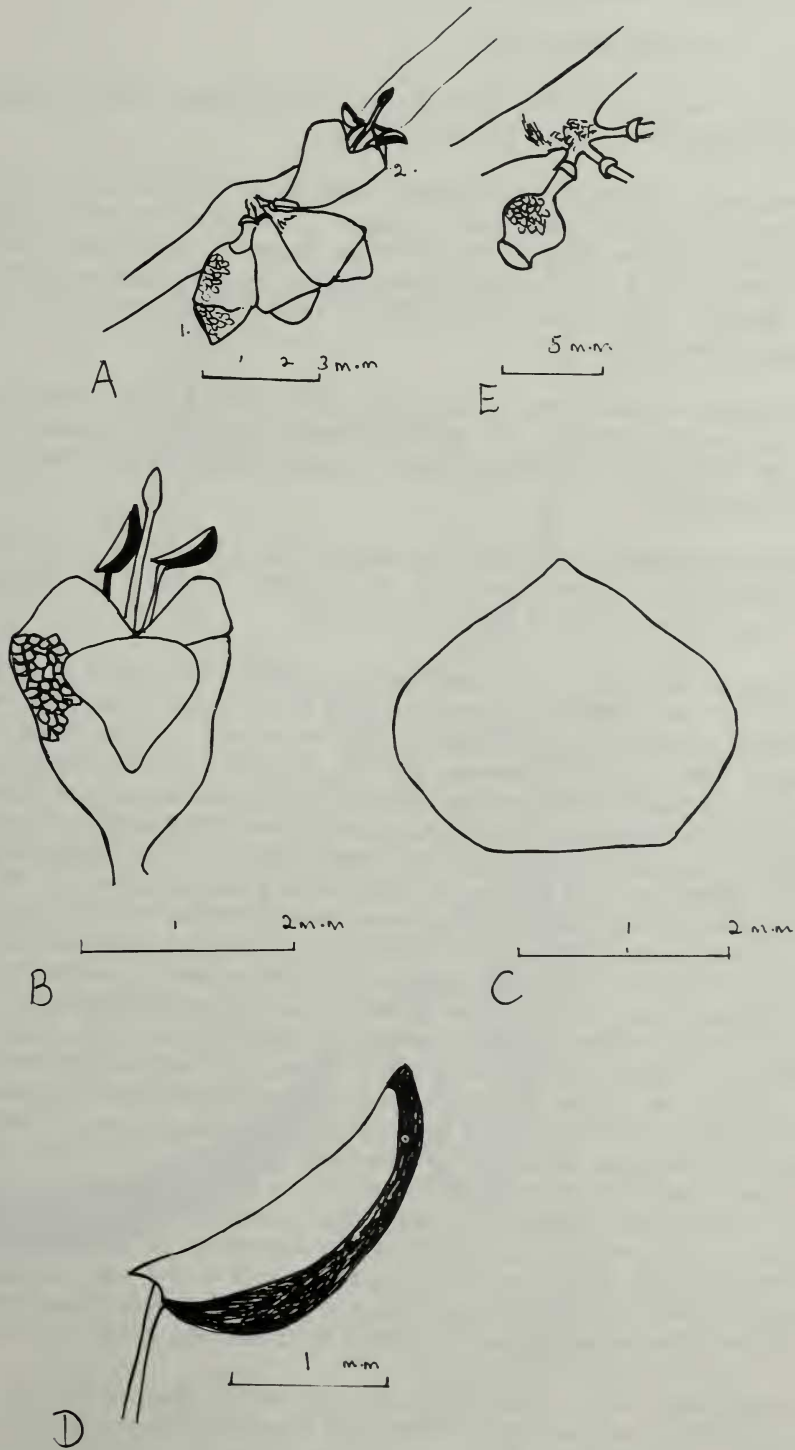


Fig. 10. *Pternandra galeata* (Korth.) Ridl. var. *galeata* - - A-D: Corner sn, Sungei Sedili, Johore on 27 March 1932; E: Maxwell 78-260.

Borneo. Sabah – Keningau: Cockburn 73016.

Brunei – Ulu Damit: Ashton 932.

Sarawak – Segan For. Res., Bintulu: Paie 15589; Sungei Arang, Baram: Yakup 11209; Ulu Sungei Karap, Baram: Anderson 30709.

Kalimantan – Balikpapan: Kostermans 4456, Neth. Ind. For. Serv. 24637 (aff.); Bandjermasin: Korthals sn (holotype L, isotype L), Motley 200; Berau: Kostermans 21540; Danau Menjeban: Main 2162; Ioa Haur, Samarinda: Kostermans 6868, 9916; W. Koetai: Neth. Ind. For. Serv. 29231; Kuala Kuajan, Sampit: Kostermans 4721, 8066; Lampit: Buwalda 7935; Mentawir, Balikpapan District: Kostermans 9706; Pelawan Besar, Sangkoelirang: Walsh 748.

New Guinea – Manikiong: Koster 1212 (aff.); Sepik-Gebiet: Ledermann 8585 (*Kibessia galeata* (Korth.) Ridl. var. *pluriflora* Mansf., isotype L); Vogelkop Peninsula: van Royen 4006 (aff.); Warsamson Valley, Sorong: Schram 12887; Western District, Kiunga: Katik 46796.

10. *Pternandra galeata* (Korth.) Ridl. var. *elmeri* (Merr.) Maxw., *stat. nov.* *Pternandra elmeri* (Merr.) Nayar, Bull. Bot. Survey India 17 (1978) 53. *Kibessia elmeri* Merr., Univ. Calif. Publ. Bot. 15 (1929) 228.

Tree up to 20 m tall with a diameter up to 45 cm. Bark smooth to scaly, brown, peeling off in 1 mm long strips; inner bark pale white-brown, 2 mm thick, white near the cambium; sapwood white. Branchlets cylindric, smooth, c. 3 mm thick, drying tan to blackish. Blades thick coriaceous, glabrous, broadly ovate, acuminate at the tip (acumen c. 1 cm long), broadly rounded and slightly decurrent at the base; 3-nerved from the base, nerves sunken above, raised and tapering below; intramarginal nerves thin, 1–2 mm from the margin, disappearing in the upper part of the blade; secondary venation distinct, pinnate from each main nerve, anastomosing and reticulate; 12–16 cm long, 8–10 cm wide; drying olive-greenish to brown above, greenish to light brown (black in juvenile blades) below. Petioles 8–10 mm long, 3–4 mm thick, glabrous. Inflorescences in fascicles from leafy or leafless nodes, of 3–5 flowered cymes c. 1 cm long or of solitary flowers; axes glabrous, slightly flattened. Bracts and bracteoles ovate, acute at the tip, 1–1.5 mm long, persistent. Primary axes up to 5 mm long with 1–2 nodes, secondary axes usually not developed, pedicels 0.5–0.75 mm long. Calyx campanulate, glabrous, with a tessellate or slightly umbonate pattern, scales smaller near the pedicel, largest near the margin; 4–5 mm long, 4–5 mm wide; cap dome-shaped, smooth and glabrous, splitting into 4 triangular lobes each c. 4 mm long, falling off as the petals mature. Bud petals broadly ovate to suborbicular, obtuse to acute at the tip, narrowed and truncate at the base, thickened, venation faint, white. Bud filaments flattened, c. 2 mm long; bud anthers 2–2.5 mm long. Stigma c. 1 mm long. Style slender c. 5 mm long in bud, elongating to 8 mm in fruit. Fruits urceolate, 7–8 mm long, 7–9 mm wide, tessellate, areolus 3–4 mm wide; white, drying brown to blackish; pericarp c. 0.5 mm thick. Seeds numerous, flattened, rhombic-quadrangular-cuneate, c. 0.75 mm long, glossy tan to light brown.

Kibessia elmeri Merr., which Merrill placed in section *Macroplacis* Cogn. where the calyx cap opens into 4 lobes and the anthers lack a connective spur, is similar to *P. galeata* var. *galeata* in the structure of the inflorescence, calyx pattern, petals, and fruits. In several specimens of *P. galeata*, e.g. Kostermans 9916, from Kalimantan, the calyx splits into 4 lobes and the anthers have a small spur near the filament. Elmer 21337, an isotype of *K. elmeri*, has only a few loose buds and immature fruits, and the anthers are too

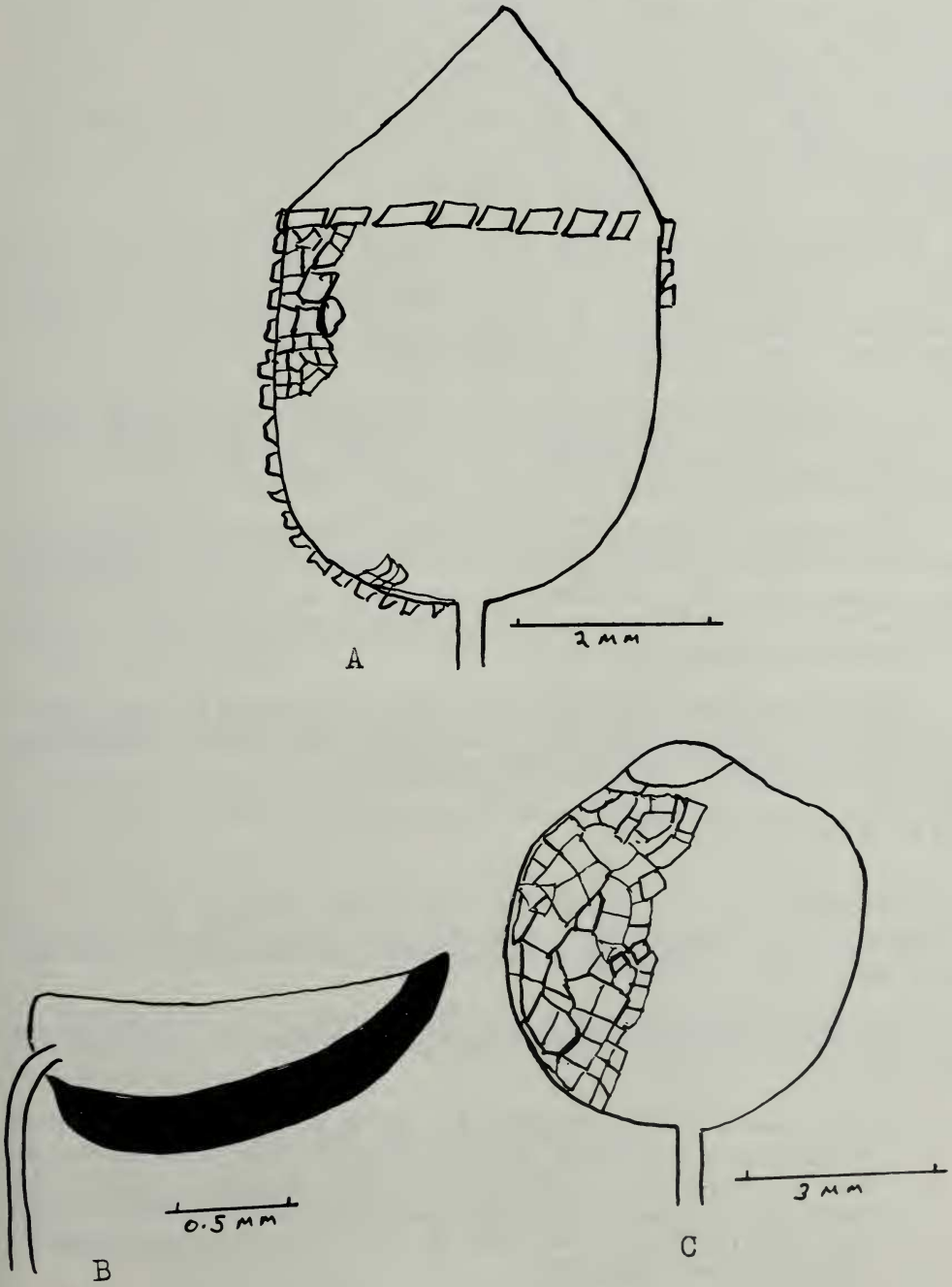


Fig. 11. *Pternandra galeata* (Korth.) Ridl. var. *elmeri* (Merr.) Maxw. - - A-C: Elmer 21337 (isotype).

immature to determine whether or not such a spur is present. Singh 30042, from Sabah, has leaves which match Elmer 21337, and also has one inflorescence with some loose fruits which are urceolate and have a tessellate pattern. These fruits match those of several specimens of *P. galeata*, e.g. Soepadmo 29 (Sumatra) and Paie 15589 (Sarawak), however these two specimens have smaller and thinner blades which do not resemble those of var. *elmeri*. I still have not seen mature flowers of var. *elmeri*, however from the specimens available it is apparent that var. *elmeri* is very closely related to *P. galeata* due to the tessellate calyx pattern, cap which splits into 4 lobes, and the urceolate fruits. Important differences between the two taxa include the larger, thicker blades, and the larger and more branched inflorescences of var. *elmeri*.

The generally larger inflorescences of var. *elmeri* are identical in structure to some specimens of *P. rostrata* (Cogn.) Nayar with large leaves, e.g. Hose 462 (Sarawak); and Kadir 2726, Singh 22369 (both from Sabah); however the latter taxon differs in usually having thinner blades, umbonate to tuberculate calyx tube pattern, calyx cap which falls off in one piece, and campanulate-truncate fruits.

- *Pternandra congniauxii* Nayar, the type of section *Macroplacis* Cogn. (*Kibessia korthalsiana* Cogn.), is similar in the splitting of the calyx cap and urceolate fruits, but differs in having a tuberculate calyx pattern and 5-nerved, cordate blades.

Referable here is a vegetative specimen collected by the Neth. Ind. Forest Service (16214, from Kalimantan) which has leaves similar to those of var. *elmeri*. This specimen also resembles large-leaved collections of *P. coerulescens* Jack which often has nearly sessile or shortly cymose inflorescences. *P. coerulescens* is easily distinguished by its lack of a calyx cap and globose fruits.

Nayar's recombination of *Kibessia elmeri* Merr. to *Pternandra* was done without having seen any relevant material, thus *P. elmeri* (Merr.) Nayar is merely another indication of Nayar's inability to do critical botanical research.

Fig. 11. A: calyx; B: stamen; C: fruit.

Distribution:

Borneo. Sabah — Tawau: Elmer 21337 (isotypes L, SING), Baradaya For. Res.: Singh 30042.

Kalimantan — central Kutei: Kostermans 10325; W. Koetai: Neth. Ind. For. Service 16214 (aff.).

11. ***Pternandra gracilis*** (Cogn.) Nayar, Bull. Bot. Survey India 17 (1978) 53. *Kibessia gracilis* Cogn. in DC., Monogr. Phan. 7 (1891) 1110; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 451; Schwartz, Mitt. Inst. Bot. Hamburg 7:3 (1931) 256; Bakhuizen f., "Thesis" (1943) 323 (name), Med. Mus. Bot. Utrecht 91 (1943) 323 (name), Rec. Trav. Bot. Neerl. 40 (1943-45) 323 (name). *Pternandra viridula* Ohwi, in *scheda* (L, BO).

Shrub 2-5 m tall or a tree up to 10 m high, diameter up to 15 cm. Bark smooth, pale grey-brown, outer and inner bark brownish, cambium pale whitish, sapwood brownish. Brachlets 4-angled, frequently flattened and grooved on two faces below the upper node, c. 1 mm thick, glabrous (rarely setose); epidermis light brown, peeling off leaving

a smooth, cylindrical, glabrous khaki-tan coloured surface when dry. Blades chartaceous, glabrous, lanceolate to elliptic, acuminate at the tip (acumen c. 1 cm long), narrowed and decurrent for 1–2 mm at the base; 3-nerved from the base, nerves sunken above, prominently raised and tapering below; intramarginal nerves thin, c. 1 mm from the margin; secondary venation pinnate from each of the 3 main nerves, c. 20–30 pairs, anastomosing and reticulate; drying brownish, often with an olive hue, above; lighter brown below; 5–15 cm long, 2.5–5 (8) cm wide. Petioles flattened, glabrous, 3–4 mm long, 1–2 mm wide. Inflorescences of solitary flowers or in clusters, from leaf axils; primary axes 1–3 mm long with one or two nodes, each with one pedicel, pedicels c. 1 mm long. Bracts ovate, acute, up to 1 mm long; axes and bracts glabrous. Calyx tube campanulate, glabrous, densely tuberculate in the lower part, appendages becoming longer (up to 1 mm), thicker, and often somewhat flattened (mucicate to narrowly echinate) in the upper half, especially near the margin; 3–5 mm long, 4–5 mm wide, pink to red; cap dome-shaped, rounded at the tip, glabrous, 4-grooved, c. 1.5 mm long, up to the middle provided with appendages similar to those about the margin, splitting into 4 persistent, triangular, acute lobes, each c. 1.5 mm long. Petals thin, glabrous, broadly ovate to sub-orbicular, broadly rounded at the tip, clawed at the base, c. 4 mm long, 3 mm wide; filaments flattened, 2–4 mm long; anthers c. 2 mm long, 1 mm wide, pale pink. Stigma oblong, cylindrical, c. 1 mm long, 4-lobed, yellow. Style slender, 5–8 mm long, elongating to 10 mm after flowering, pale pink. Fruits globose, appendages similar to those in flower, often less densely spaced or nearly smooth with little trace of the scales, 6–8 mm wide, orange turning red; calyx lobes persisting, green or yellow; pericarp c. 0.2 mm thick. Seeds numerous, rectangular-quadrate, often flattened, c. 1 mm long, glossy khaki-tan coloured.

Habitat: primary, frequently dipterocarp, forests

Vernacular: puloh (Iban).

Pternandra gracilis (Cogn.) Nayar is easily distinguished from all other taxa of *Pternandra* by its solitary flowers on each primary axis, axes which are never more than 5 mm long, tuberculate-echinate calyx tube, cap which also has appendages and splits into 4 persistent lobes; and the chartaceous, glabrous blades which are narrowed at both ends.

Pternandra tuberculata (Korth.) Nayar is sometimes confused with this species, but the former has larger and longer inflorescences, larger flowers with an umbonate to tuberculate pattern, smooth cap, thicker blades, and larger fruits.

Clemens 21580, from Sarawak, differs from all other specimens of *P. gracilis* examined in having black, minutely setose branches. The leaves and fruits are identical to those of other specimens of *P. gracilis*.

Fig. 12. A, B: calyx; C: Mature petal; D: stamen; E: immature fruit.

Plate 5. Holotype of *Pternandra gracilis* (Cogn.) Nayar.

Distribution:

Borneo. Sabah – Gunong Balapau: Richards 2414; Gunong Lumaku: Nootboom 1176; Lumat, Beaufort: Madani 35095; Mt. Kinabalu: Carr 26691; Chew, Corner, Stainton 97, 1201; Clemens 28071, 29592, 31285, 32134, sn in May 1933; Mt. Trusmadi: Nootboom 1368; Sungei Tuban: Ashton 18371; Usun Arau: Asah ak Luang 22684.

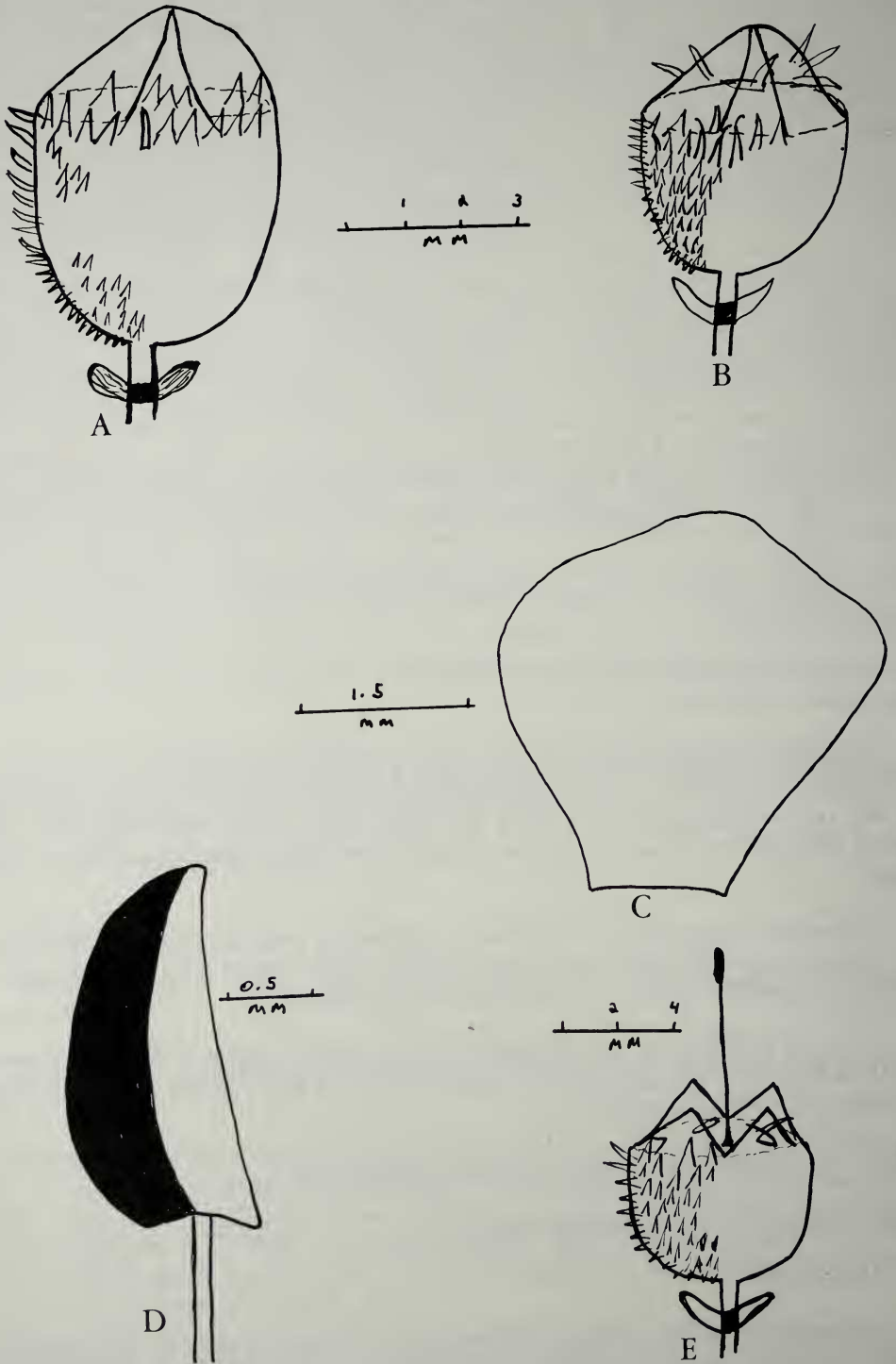


Fig. 12. *Pternandra gracilis* (Cogn.) Nayar - - A, C, D: Beccari 3172 (holotype); B: Ashton 18371; E: Ashton 720.

1879/77/009

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H. BECCARI. PIANTE BORNENSI.

112 *Pternandra gracilis* Cogn. sp. nov.
Sarawak

RAGIATO DI SARAWAK

H. Beccari
Sarawak

HERBARIUM
LEIDEN
1879

Plate 5. *Pternandra gracilis* (Cogn.) Nayar, holotype at Florence, which was collected by Beccari in Sarawak in March 1867. Photo: Rijksherbarium, Leiden.

Brunei — Andulau For. Res.: Ashton 385; Kuala Temorong, Machang: Ashton 720.

Sarawak — Bukit Iju: Luang 23248; Bukit Mentagai: Luang 23263; Bukit Salong, Kapit: Paie 25858, 25862; Gat, upper Rejang River: Clemens 21580; Lanko Battu: Beccari 3172 (holotype (4244) FI; isotypes (4244A) FI, BR).

Kalimantan — W. Koetai near Mt. Kemoel: Endert 3866.

12. *Pternandra hirtella* (Cogn.) Nayar, Bull. Bot. Survey India 17 (1978) 52 ("*birtella*").
Kibessia hirtella Cogn. in DC., Monogr. Phan. 7 (1891) 1107; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 451; Bakhuizen f., "Thesis" (1943) 313, Med. Mus. Bot. Utrecht 91 (1943) 313, Rec. Trav. Bot. Neerl. 40 (1943–45) 313.

Tree up to 12 m tall, diameter up to 15 cm. Outer bark smooth, thin, very dark grey to black, longitudinally cracked; inner bark dark red; wood moderately hard, sapwood pale yellow, heartwood darker and staining reddish after exposure. Branchlets 4-angled, sometimes narrowly undulate-winged, densely red-brown pilose, c. 2 mm thick, epidermis flaking off leaving a smooth, cylindric, glabrous, tan-khaki coloured surface. Blades subcoriaceous to coriaceous, elliptic to ovate, acuminate at the tip (acumen 0.5–1.5 cm long); narrowed, less frequently rounded, and shortly (1–2 mm) decurrent at the base; 3-nerved from the base, nerves sunken above, prominently raised and tapering below; intramarginal nerves thin, 1–1.5 mm from the margin, sometimes giving the blades a 5-nerved appearance at the base; secondary venation pinnate from each of the 3 main nerves, c. 15–25 pairs, slightly raised below, anastomosing and reticulate; blades glabrous above, sparsely to densely red-brown pilose, especially on the main nerves, below; 9.5–20 cm long, (3) 4.5–8.5 cm wide, dark green above, paler beneath, glossy on both sides, drying olive-brownish to dark brown above, brown below. Petioles flattened, 4–8 mm long, 2–3 mm wide, densely red-brown pilose. Inflorescences of solitary flowers from leafy nodes or in terminal, 3-flowered umbels; axes 4-angled, densely red-brown pilose. Bracts and bracteoles lanceolate, acute at the tip, 4–7 mm long, 1–2 mm wide, densely red-brown pilose, persisting. Primary axes 0.5–1.5 cm long, 1.5–2 mm thick, solitary flowers with 2–4 nodes, the umbels with one node; secondary axes not developed in solitary flowers or up to 4 mm long, pedicels 2–4 mm long. Calyx tube campanulate, 6–8 mm long, 5–7 mm wide, densely covered with setaceous bristles which are shorter and simple near the base and longest (2–3 mm) and barbed near the rim, frequently curved or hooked, densely red-brown pilose; calyx cap conical, acuminate, c. 6–7 mm long, 5–7 mm wide, with a whorl of bristles near the middle; densely red-brown pilose throughout; falling off as a single unit, often remaining attached to one side of the rim in fruit, up to 1.5 cm long. Mature flowers not seen. Bud petals slightly thickened, broadly ovate, acute at the tip, truncate at the base, 6–7 mm long, 5–6 mm wide, margin thinner, white. Bud anthers inappendiculate, c. 2 mm long, 1 mm wide, pale mauve; filaments flattened. Stigma cylindric, slightly twisted to the right, later splitting into 4 lobes, 2.5 mm long. Style slender, c. 6 mm long, glabrous, elongating to 12 mm in fruit. Fruits subglobose, truncate, covered with pilose bristles, 8–10 mm long, 11–13 mm wide, areolus 7–8 mm wide, internal lines distinct, 16, glabrescent; exocarp greenish, reddish, then dark violet when ripe; pericarp c. 1.5 mm thick, gritty. Seeds numerous, flattened, rectangular-cuneate, glossy khaki-tan.

Habitat: primary lowland forests

Vernacular: merkatak (Kuching, Sarawak); puloh, pulu (Iban)

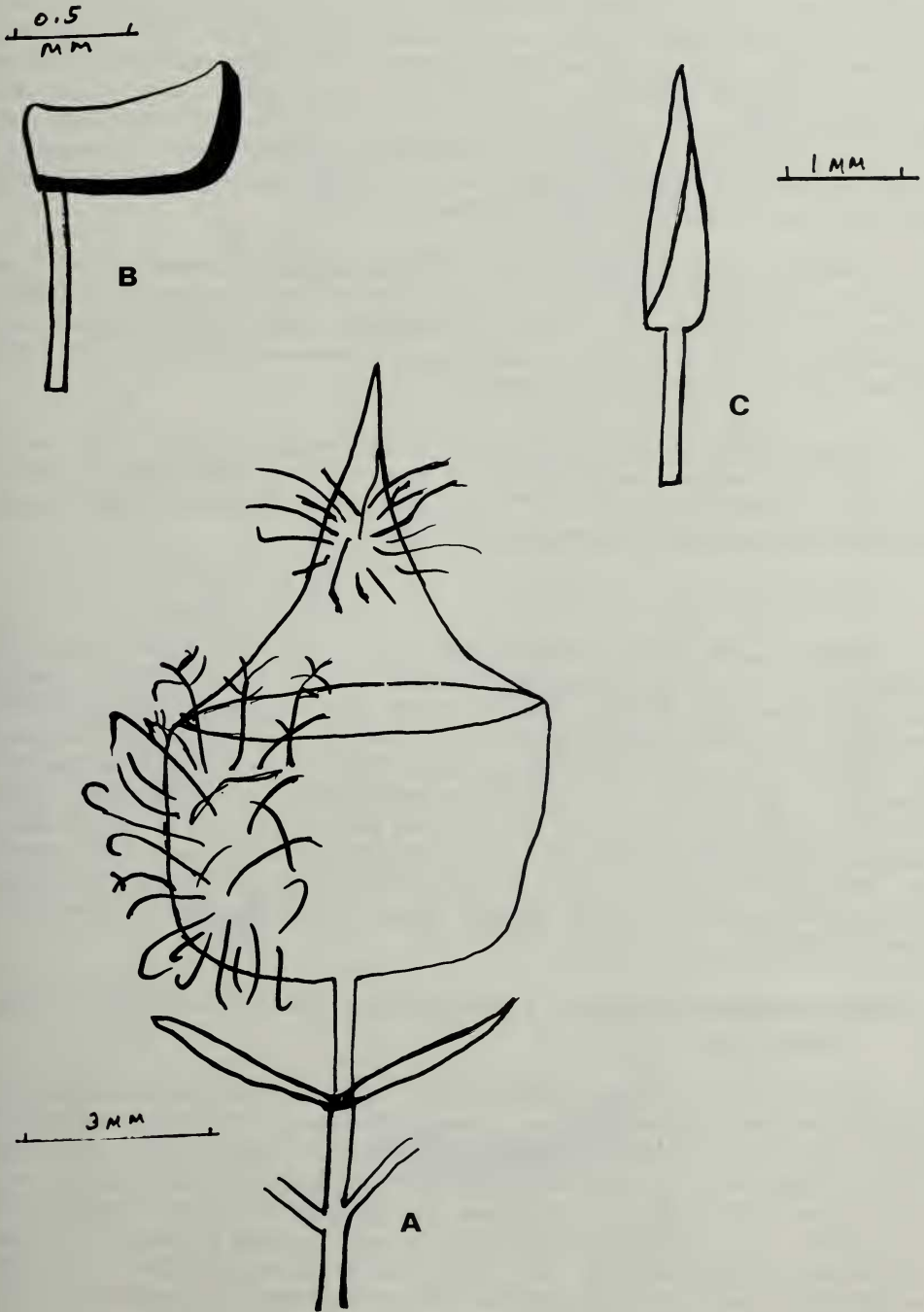


Fig. 13. *Pternandra hirtella* (Cogn.) Nayar. A: Ridley 12281; B, C: Carrick & Enoch 349.

As far as the basic structure of the inflorescence and calyx bristles are concerned, *P. hirtella* closely resembles *P. azurea* (Bl.) Burk. var. *azurea* and var. *cordata* (Korth.) Maxw. There are several specimens at Singapore and Leiden of both varieties of *P. azurea* which have setose bristles which are mostly unbranched (e.g. Endert 3195. Kostermans 9043, and Nahar 12700 – all from Borneo); however with other specimens of *P. azurea* there is considerable variation in the density, branching, and thickness of the calyx appendages. The bristles in *P. hirtella* are constant, i.e. the lower part of the calyx tube consists mostly of curved and barbed appendages, while those near the margin are branched. This species is quite constant in its characteristics and I have seen that it differs little in pubescence, leaf texture and shape, and the flowers.

P. hirtella is easily distinguished from all other species of *Pternandra* by its dense, red-brown pubescence which persists on the branches, blade undersurfaces, petioles, inflorescence axes, flowers, and fruits. The fruits differs from that of *P. azurea* in being subglobose and truncate, rather than campanulate and truncate. The blades in *P. hirtella* are also larger and thicker than in *P. azurea*.

Cogniaux (1891) lists two syntypes for this species viz. de Vriese sn and Beccari 17 – both from Borneo. I have not seen de Vriese's specimen which Cogniaux indicates is at Leiden, however Beccari 17, at Florence, was examined on loan and has been designated as the lectotype of *Pternandra hirtella* (Cogn.) Nayar.

Distribution:

Borneo Sarawak – Bako National Park: Ashton 17815; Carrick & Encoh 349; Purseglove 5043; Batu Anam: Dauk & Tachun 35601, 35604; Bukit Empan Ra'a, Serian: Paie 28069; Bukit Iju, Ulu Arip, Balingian: Luang 23610; Gunong Santubong, Kuching: Bujang 13698; Kuching: Banyeng & Sibat 24913; Beccari 17 (lectotype, FI); Haviland sn on 14 April 1893; Lambir Forest, Miri: Morshidi 24090; Penkulu Ampat: Haviland 175; Sampadi For. Res.: Paie 27694; Santubong, Kuching: Ridley 12281; Santulang: Ridley sn in Jan. 1918; Selang For. Res., Kuching: Paie 8452; Semengoh For. Res., Kuching: Anderson 14643, 26854; Bojeng 14643; Brain 5368; Brown 2290; Galau 15703; Setapuk For. Res., Kuching: Bojeng 9304; Sundu: Bishop (Hose) & Haviland 230 (inflor. abnormal); Sungei Sabal, Tapang, Serian: Sinclair 10277; Ulu Kakus, Anap: Haron 29993; Ulu Kuyong, Anap: Chai 19317.

13. *Pternandra multiflora* Cogn. in DC., Monogr. Phan. 7 (1891) 1104; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 452.

Tree up to 15 m tall with a diameter up to 1 m. Bark smooth, grey or mottled with brown; inner bark greyish to yellow, sapwood greyish-brown. Branchlets flattened and deeply grooved on the flattened faces, often 4-angled, becoming cylindric, 1.5–2 mm thick, epidermis brown to black, peeling off leaving a tan-khaki coloured surface; nodes flattened and swollen. Blades subcoriaceous, glabrous, elliptic to ovate, acuminate at the tip (acumen 1–1.5 cm long), narrowed and frequently shortly decurrent at the base; prominently 3-nerved from the base, nerves sunken above, prominently raised and tapering below; lateral veins less prominent than the midvein; intramarginal nerves thin, 1–2 mm from the margin; secondary venation pinnate from each of the 3 main nerves, c. 15–25 pairs equally prominent on both surfaces, slightly raised, anastomosing and prominently reticulate; 12–22 cm long, 5.5–7.5 cm wide; drying olive-brown above, brown below. Petioles flattened, 5–10 mm long, 2–3 mm wide. Inflorescences panicate from behind the leaves and on thicker branches, 15–30 cm long, very loose and open, many-flowered; axes grooved near the nodes, otherwise 4-angled, smooth, glabrous,

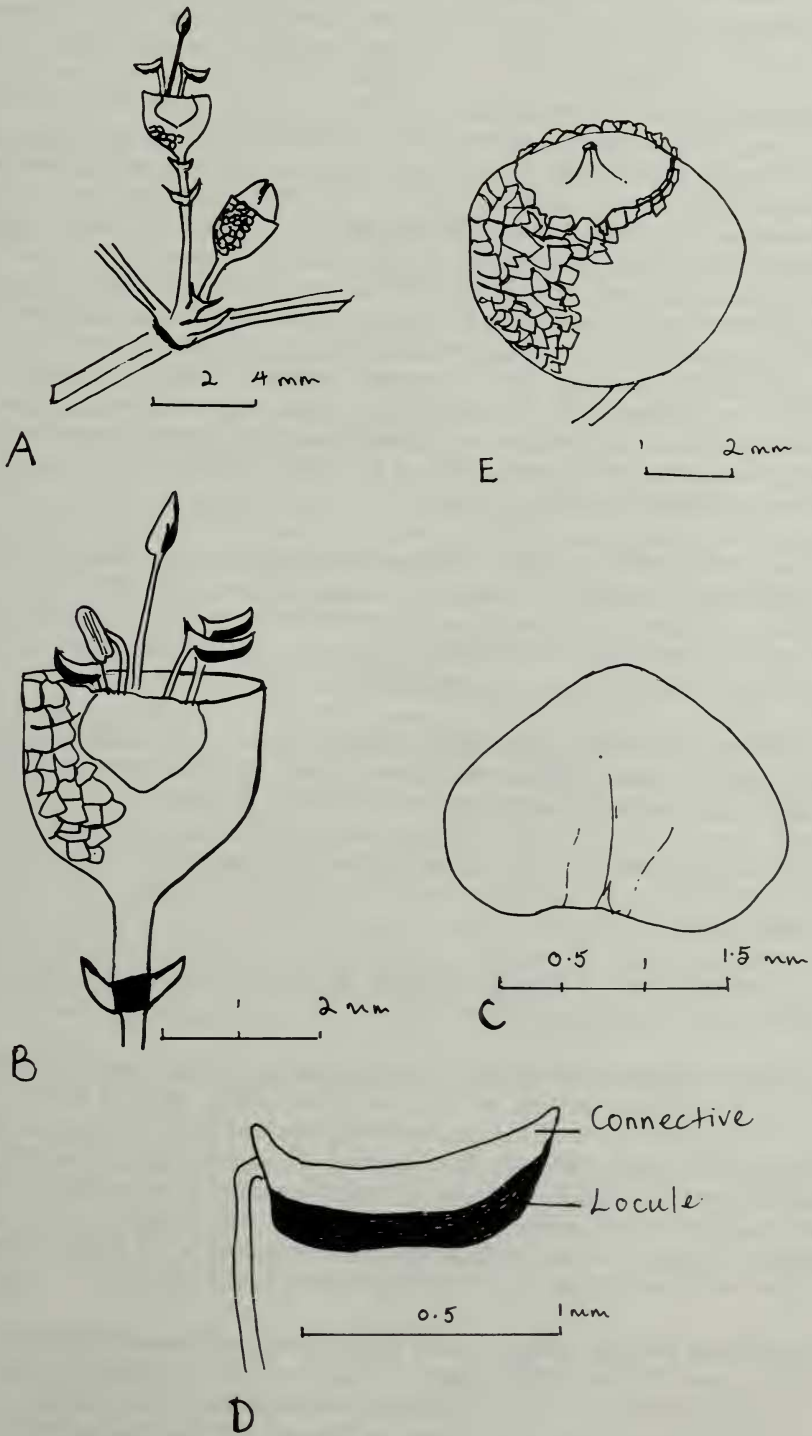


Fig. 14. *Pternandra multiflora* Cogn. -- A-D: Purseglove 5149; E: Brain 5369.

drying dark brown to blackish; primary axes generally solitary at each node, less frequently paired, 10–25 cm long with 3–5 nodes; secondary axes 2 or 4 from each node of the primary axis, peripheral axes less developed, 3–8 cm long with 1–3 nodes; 3d axes c. 1–2.5 cm long, 4th 5–10 mm, 5th not developed or up to 4 mm long, pedicels 1–2 mm long. Bracts and bracteoles lanceolate, acute, 0.5–2 mm long. Calyx tube campanulate-cyathiform, scales few, tessellate to umbonate, rather large, often indistinct giving a rugose texture, 2.5–3 mm long, 2 mm wide, smooth and glabrous; internally with faint lines, margin often appearing 4-lobed with the extension of 4 large scales alternating with 4 smaller ones at the margin, pale yellow. Petals yellow, ovate to sub-orbicular, broadly rounded at the tip, broadly rounded and truncate to broadly clawed at the base, 1.5–2 mm long, 1.5–2 mm wide, thin with visible venation. Filaments flattened, c. 1.5 mm long, 0.5 mm wide; anthers c. 1 mm long, yellow, connective thick, often papillose, ridge-like with a short spur extending beyond the filament. Stigma capitate, 4-grooved, c. 0.75 mm long. Style somewhat flattened, slender, 5–6 mm long. Fruits (sub)globose, truncate with remnant scales at the tip, tessellate-rugose and minutely lepidote externally, 5–8 mm diameter; areolus 4 mm wide, style often persisting, exocarp ripening orange to light brown, drying khaki-tan; pericarp c. 0.2 mm thick. Seeds numerous, rhombic-cuneate-quadrangular, c. 0.5 mm long, tan to light brown, glossy.

Pternandra multiflora Cogn. is easily distinguished from all other species of *Pternandra*, especially *P. coerulescens* Jack, by its long, complex, many-flowered inflorescence; tessellate to umbonate calyx pattern, and absence of a cap. The yellow petals and fruits also appear to be distinct. The closest species is *P. coerulescens* which has smaller inflorescences; thick white, blue, or purple petals; and fruits which dry black.

Cogniaux notes in his description that the fruits of *P. multiflora* are shallowly 4-grooved (*leviter 4-sulcata*), however I have not seen this character on any of the fruiting specimens of this species in the Singapore or Leiden collections.

Fig. 14. A: inflorescence; B: flower; C: mature petal; D: stamen; E: fruit.

Distribution:

Borneo Sabah – Beaufort District: Madani 35246; Beaufort Hill: Mikil 31979; Sun Suran Trail, Penampang District: Mikil 37755.

Sarawak – Bukit Lambar, Miri: Luang & Nulong 24464; Gunong Matang, Kuching: Chai 19758; Kuching: Bojeng 9428; Lambir Forest, Miri: Morshidi 22892; Lebang For. Res., Bintulu: Paie 15836; Limbang, Kunaëang: Haviland 68 (544); Matang: Beccari 1551 (lectotype FI), 2981 (syntype FI); Haviland sn on 24 Aug. 1888; Miri: Dan 1907 (S1458), Hose 598; Miri River: Hose 71; Niah River, Miri District: Wright 29135; Pelagus For. Res.: Chai 33177; Penkulu Ampat: Haviland 476; Selang For. Res.: Paie 8484; Semengoh For. Res.: Brain 3569; Sungei Tau: Purseglove 5149; Tegora: Haviland 2019; exact location unknown: native collector 1139 (distribution Manila).

14. *Pternandra rostrata* (Cogn.) Nayar, Bull. Bot. Survey India 17 (1978) 53. *Kibessia rostrata* Cogn. in DC., Monogr. Phan. 7 (1891) 1110; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 451. *Kibessia verrucosa* Merr., J. Str. Br. Roy. As. Soc. 86 (1922) 341, *syn. nov. Pternandra verrucosa* (Merr.) Nayar, l.c. 53; *Kibessia verruculosa* Merr., Univ. Calif. Publ. Bot. 15 (1929) 227 (*sphalm.*) *Kibessia affinis* Merr., l.c. (1929) 227, *syn. nov. Pternandra affinis* (Merr.) Nayar, l.c. 53.

Kibessia tuberculata (Korth.) Hk. f. var. *grandifolia* Bakh. f., "Thesis" (1943) 322, Med. Mus. Bot. Utrecht 91 (1943) 322, Rec. Trav. Bot. Neel. 40 (1943-45) 322, *syn. nov.* *Pternandra grandifolia* (Bakh. f.) Nayar, l.c. 53.

Tree 8-15 m tall, diameter up to 25 cm, or a shrub up to 3 m tall; buttressed in older individuals. Bark smooth, grey-brown, thin, finely fissured; inner bark red-brown, thin; sapwood pale yellow. Branchlets cylindrical, often somewhat flattened or obscurely 4-angled below the upper node, 1.5-2.5 mm thick, smooth, drying grey to brownish. Blades subcoriaceous to coriaceous, glabrous, elliptic to ovate (often broadly so), acuminate at the tip (acumen 0.5-1 cm long), narrowed or broadly rounded and usually decurrent at the base; prominently 3-nerved from the base, nerves sunken above, raised and tapering below; intramarginal nerves faint, 1-2 mm from the margin, disappearing in the upper half of the blade; secondary venation pinnate from each main nerve, conspicuous, anastomosing and reticulate; 6.5-21 cm long, 3-10 cm wide; dark, often glossy, green above; green below; drying dark brown to olive-brown above, brown to tan-brown or with a greenish hue below. Petioles flattened, 2-8 mm long, 1.5-4 mm thick, glabrous. Inflorescences of axillary or terminal cymes of 3 or of solitary flowers, 1-2.5 cm long, axes somewhat flattened to 4-angled, glabrous; primary axes usually several from leaf axils, with 1-3 nodes, solitary flowers generally having two nodes and two pairs of bracts as the secondary axes have not developed, c. (1) 5-10 mm long; secondary axes not developed or 3-5 mm long; pedicels (0.5) 1-3 mm long. Bracts and bracteoles lanceolate to ovate, acute, 1-2 mm long, persistent, green. Calyx tube campanulate, ornamented with raised tubercles (umbonate to tuberculate), glabrous, 4-6 mm long, 3-5 cm wide at maturity; cap conical, thick, acute to rostrate, falling off in one piece, 3-8 mm long, 4-5 mm wide; green; tube smooth and obscurely 16-lined internally, lines opposite and alternating with the filaments. Petals thick, broadly ovate to suborbicular, often asymmetric, broadly rounded and apiculate at the tip, shortly clawed at the base, 6-8 mm long, 8-10 mm wide, reflexed at maturity, lilac. Filaments flattened, 3-4 mm long, lilac; anthers subreniform, connective with a dorsal extension near the filament, c. 2 mm long, yellow. Stigma clavate-cylindric, 1-2 mm long, yellow. Style 5-6 mm long, whitish, elongating to about 10 mm and persisting in fruit. Fruits campanulate, truncate at the top, 7-9 mm long, 10-12 mm wide, areolus 7-9 mm wide, internal ridges and lines distinct; exocarp green, umbonate to distinctly tuberculate; pericarp c. 1.5 mm thick, gritty. Seeds numerous, rectangular-quadrate, often appearing cuneate, c. 1.0 mm long, testa glossy tan.

Vernacular: nipis kulit, tahi kerlan, talinga basing (Brunei), sandi-sandi (Dusun-Kinabatangan).

Pternandra rostrata is very variable in the size and texture of the leaves, pattern on the calyx tube and fruits, and shape of the calyx cap. This species differs from *P. tuberculata* (Korth.) Nayar which has a more slender and more branched inflorescence, and a short calyx cap which splits into 4 lobes. The leaves of the two species are usually indistinguishable.

The type collection of *P. rostrata* (Beccari 979, from Sarawak) has a rostrate calyx cap which apparently falls off in one piece. Other specimens with a rostrate cap, e.g. Haviland 972, Kadir 2726, and Gansau 46311; vary in the size and texture of the leaves, and length of the inflorescences. The calyx pattern ranges from umbonate to tuberculate and in many other collections several different patterns can be found on the same specimen, that is umbonate, verruculose, and tuberculate patterns. These patterns do not correlate with the size or shape of the leaves.

Pternandra verrucosa Merr. has the same leaves as Beccari 979, and with the few loose fruits on paratype specimens (Ramos 1191, from Sabah), Merrill's description of the inflorescence and comparison with many specimens of *P. rostrata* at Singapore and Leiden, I cannot find any constant differences between the two taxa. Mature flowers are sparse, and from the internal structures from buds I cannot make any distinctions either.

The isotype of *P. affinis* Merr. (Elmer 21478, from Sabah) has leaves which could easily be confused with several specimens of *P. galeata* (Korth.) Ridl., but the loose fruits have a tuberculate pattern. Although the shape of these fruits is urceolate, as with *P. galeata*, the specimen is actually *P. rostrata*. Confirming evidence lies in the fact that many immature fruits of *P. rostrata* are urceolate with a verrucose to tuberculate pattern (not tessellate as with *P. galeata*) and in some specimens, e.g. Gansau 46311, fruits identical to Elmer 21478 plus buds with a rostrate cap are on the same specimen. Aside from the fact that the pattern on the fruits differ, the presence of a cap which falls off in one piece (in contrast to the caps which split into 4 lobes with *P. galeata*) is sufficient proof for me to consider *Kibessia affinis* as a synonym of *P. rostrata*.

Several collections from Borneo (e.g. Meijer 37999, Gibot 60613, Mikil 38496, Latangah 33144, etc.) collected at elevations above 1300 m. have much smaller leaves and more obtuse calyx caps than most other specimens of *P. rostrata* that I have seen. These specimens will require further study with more flowering and fruiting material in order to determine their exact taxonomic status. I have included them in this section since they do not resemble any other species of *Pternandra* that I have studied.

Kibessia affinis Merr., *K. verrucosa* Merr., and *K. tuberculata* var. *grandifolia* Bakh. f. are, in my opinion, all synonyms of *P. rostrata*. Even with type material of all these taxa, deciding on their true taxonomic status has been difficult since these specimens are, in general, not only incomplete, but also in poor condition. Reconstructing various aspects of each one of them has been by comparison with other specimens at Singapore and Leiden which match each type, plus the original descriptions.

All of these taxa have shortly cymose (up to 2 cm) inflorescences; campanulate calyx tubes with umbonate to verrucose scales; smooth and acute to rostrate caps; thick and broadly ovate to suborbicular (often asymmetric) petals; and campanulate fruits with a truncate apex and an umbonate to verruculose pattern. The different taxa have leaves which vary in size and, combined with the various stages of flower or fruit development for each specimen, has resulted in considerable taxonomic confusion.

The isotype of *K. affinis* (Elmer 21478, from Sabah) has several fruits in various stages of development, most of which are slightly constricted below the margin giving a somewhat urceolate appearance. The pattern on these fruits is identical to that on the only mature fruit (which is crushed) included with Rutten 537 — the holotype of var. *grandifolia*. The fruits of Ramos 1191, a paratype of *K. verrucosa*, differ slightly in being more umbonate and less verrucose, and are not, at least in most fruits, urceolate, i.e. there is little, if any, constriction below the margin. There are, however, some fruits with Ramos 1191 which match those of *K. affinis*.

Merrill notes that *K. affinis* is closely related to (*Kibessia*) *Pternandra galeata* (Korth.) Ridl., however the latter species is easily distinguished by its tessellate to somewhat umbonate calyx pattern, and the distinctly urceolate fruits (neck 1–2 mm) with a much smoother pattern, and often with persistent calyx lobes.

Griffith 2272/1 has a few calyx specimens which have identical scales to those of var. *grandifolia*. The leaves on the two sheets show a transition from small (*P. griffithii*) to moderately large (var. *grandifolia*). As noted above, the mature fruits of var. *grandifolia* the same as those of *K. affinis* which also has individual variations which match those of *K. verrucosa*. The shape and venation of the blades in all of these taxa are essentially the same. Large blades with prominent venation of *K. verrucosa* are matched by those of var. *grandifolia*, which are slightly smaller; then progressively smaller leaves from *K. affinis*, *P. griffithii*, and *P. tuberculata*.

It is obvious from other collections in Singapore and Leiden that all of these taxa are the same since many specimens with small to large leaves have buds, flowers, or fruits which match those fragments from one or more of the type collections discussed above. In other words, these taxa have been described from individual specimens which were collected at a particular stage in the development of the individual flower or fruit. By comparing specimens collected in other stages of maturity, it is obvious that leaf size is not a constant factor since all specimens can be linked by the distinct calyx pattern and by the truncate fruits.

Fig. 15. A–F: G: mature petal; H: stamen.

Distribution:

Sumatra Exact location unknown: Beccari 179.

Borneo *Sabah* — Balat Camp, Lamag District: Lassar & Fox 72828; Balung, Tawao: Clemens 32474, Gibot 32474; Batu Lima, Sandakan: Agama 463 (*Kibessia verrucosa* Merr., paratype L), Villamil 147 (*Kibessia verrucosa* Merr., paratype L), Ramos 1722 (*Kibessia verrucosa* Merr., isotypes L, SING); Beram Bangan, Kudat District: Brand 30862; Camp Sepilok For. Res., Sandakan: J. Singh 22369; Columbon River: Clemens 34102; Dulit Ridge: Richards 1665; Elopura, Sandakan: Cuadra 2190, 2224; Taloon 10767; Garson, Tawau District: Mujin 40583; Gaya Island: Mujin 33573, Creagh sn: in May 1895, Aug. 1895, July 1896; Gunong Alab: Nootboom 959; Kabili-Sepilok For. Res.: Keith 7123, 7175; Puasa 7012; Kalumpang Tawao, Lahad Datu District: Chai 29822, 31692; Keratam Camp, Sandakan: Wing 33963; Kuala Daramakud, Kinabatangan District: Kadir 16867; Kundasong, Ranau District: Singh 27494; Loro For. Res., Kudat: Siranggol 51101; Mendulong: Nootboom 1071; Mostyn, Lahad Datu District: Agam & Aban 40855; Mt. Dulit: Richards 1108; Mt. Kinabalu: Clemens 30515, 30812, sn; Sadau 42826; Nanga Pelagos: Daud & Tachun 35669; Pock For. Res., Sempora District: Gansau 46311; Pulau Balem Bangan: Stone & Anderson 86751, 86804; Stone 13177; Pulau Gaya: Ampuria 41397, Meijer 20488; Ranau District: Leopold, Gary, Dewol 73815, Baldek 32349; Sapa Tali, Lemag: Ampuria 36418; Sandakan: Elmer 20203, Sam 21797, Tangulon 1565; Sepilok For. Res., Sandakan: Brand 30997, Charington 20870, For. Dep't. Borneo 1148; Sekong Camp, Sandakan: Wing 34921; Sekong Kechil, Sandakan: Wing 38987; Sepilok For. Res., Kennedy Bay: Siranggol 39909; Sipangar Island: Ampuria 41333; Siptiang: Madani 35127; Sosopodon For. Res.: Gibot 60613, Lajangah 33144, Meijer 37999, Mikil 38496, Mujin 33777; Sungei Dusun, Sandakan: Elleh 34360; Sunsuran, Penampang District: Binideh & Talip 65301; Supu For. Res., Kinabangan: Puasa 10071; Tawao: Elmer 21478 (*Kibessia affinis* Merr., isotypes L, SING), Gansau 47803, Gibot 30431, 34125; Tandom 8802, Wood 16459 (aff.); Tidok, Sandakan District: Hepburn 23722; Ulu Mujong, Balleh: Ashton 13975; Ulu Sungai Kalumpang: Gibot 30467.

Brunei — Bukit Lambir: Ashton 37, Fuchs 21297.

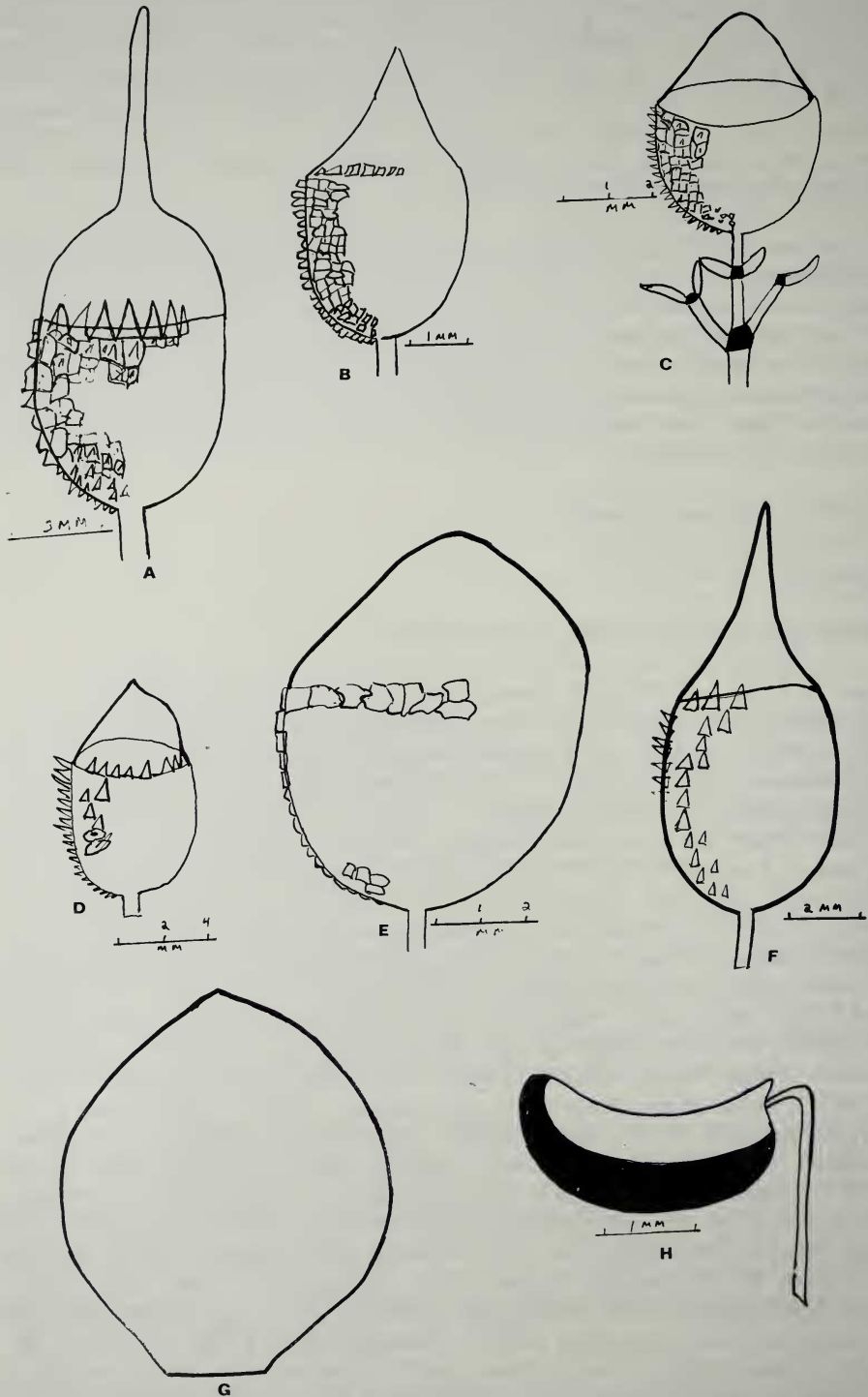


Fig. 15. *Pternandra rostrata* (Cogn.) Nayar - - A, G: Haviland 972; B, H: Hose 462; C: Kadir 2726; D: Jacobs 5302; E: Siranggal 51101; F: Brooke 10010.

Sarawak — Bettotan: Boden-Kloss 19057, Kloss 19027; Bukit Mentagai: Luang 22821; Entoyut River, Baram District: Hose 462; Gat, upper Rejang River: Clemens 21564, 21575; Gunong Mulu, Baram: Paie 15091; Gunong Rara For. Res.: Chow 75670; Gunong Sahari: Forman 498; Kuching: Haviland 972; Lawas: Brooke 10010; Lema'as For. Res.: Chong 33666; Long Kerangan, Barma District: Tong 34998; Matang: Haviland 176; Miri River, Baram District: Hose 653; Mt. Matang: Clemens 20937; Mt. Singglio: Haviland =176; Piningiao: Beccari 979 (holotype FI); Puman Besar: Geh & Samsuri 708; Rejang River, Kapit District: Jacobs 5302; Semengoh For. Res., Kuching: Ghazalli & Asah 13662; Sungei Ukong, Miri: Harom 21395; Ulu Mujong, Balleh: Ashton 13975; Ulu Sungei Bukong: Benang 24406, Luang 24454; Ulu Sungei Mamut Bakong, Miri: Luang 24377; Ulu Sungei Sekaloh, Miri: Luang 27855, Wright 29129; Ulu Tubau: Ashton 17717; exact location unknown: Becari 301.

Kalimantan — Amai Ambit: Hallier 3208; Batu Pondong, Sangkoelirang District: Kostermans 13664; Berau: Kostermans 21573; Boeloengan Beraoe: Rutten 537 (*Kibessia tuberculata* (Korth.) Hk. f. ex Cl. var. *grandifolia* Bakh. f., (holotype U); Gunong Ketapong, Sangkoelirang: Walsh 443; Hunukan: Meijer 2148; Indonesia Islands: Kostermans 21115; W. Koetai: Ender 2596, 4980; Liang Gagang: Hallier 2736; Loa Djanan, Samarinda: Kostermans 6440; Muara Muntai Kutei: Meijer 496; Soengai Sambas: Hallier 1082; Sungei Wain, Balikpapan: Kostermans 4154, 4238.

New Guinea. Sepikgebiet: Ledermann 8717a (aff.) (*Kibessia ledermannii* Mansf., isotype SING).

15. *Pternandra tessellata* (Stapf) Nayar, Bull. Bot. Survey India 17 (1978) 53. *Kibessia tessellata* Stapf, Trans. Linn. Soc. 4:2 (1894) 162; Gibbs, J. Linn. Soc. Bot. 42 (1914) 81; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 451. *Pternandra tessellata* Ohwi, *in scheda* (L, BO).

Shrub or tree 3–12 m tall, diameter up to 15 cm. Branchlets distinctly 4-undulate-winged, minutely pilose, 1–1.5 mm thick, epidermis dark brown when dry, flaking off (including wings) leaving a smooth, cylindric, glabrous, tan-khaki coloured surface. Blades chartaceous to subcoriaceous; lanceolate, elliptic, to ovate; acuminate at the tip (acumen up to 10 mm long), broadly rounded and shallowly (1–2 mm) cordate at the base; prominently 3-nerved from the base, intramarginal nerves 1–2 mm from the margin, less prominent, but often giving the blades a 5-nerved appearance; nerves sunken above, prominently raised and tapering below; secondary venation pinnate from each of the 3 main nerves, c. 20 pairs, slightly raised below, reticulate; juvenile blades puberulous on the main nerves near the petiole, adult ones glabrous; drying olive-brown to blackish above, lighter brown below, very brittle; 7.5–12 cm long, 3–5.5 cm wide. Petioles c. 2 mm long, c. 2 mm thick, at first minutely puberulous, later glabrous. Inflorescences from leaf axils, often terminal, composed of solitary flowers or 2–3-flowered umbels; axes flattened, minutely puberulous, c. 1 mm thick. Bracts and bracteoles lanceolate, acute, c. 1.5 mm long, minutely puberulous; primary axes 6–15 mm long, secondary axes not developed (solitary flowers) or up to 10 mm long; pedicels 3–5 mm long. Calyx tube campanulate, covered with tessellate-umbonate-tuberculate scales, lower ones smaller and flatter increasing in size and projection to the margin where they are triangular-tuberculate; 4–5 mm long, 4–5 mm wide, minutely puberulous, glabrescent, green; calyx cap conical, acuminate, larger buds with a few minute tubercles in the middle, smaller ones smooth, minutely puberulous throughout, falling off as one piece. Bud petals broadly ovate, acute at the tip, narrowed to the truncate base, 5–6 mm long, 7–8 mm wide, thick, lilac-blue to dark red-violet. Bud filaments flat, c. 1 mm long, inappendiculate, c. 2 mm long, yellow. Bud stigma 4-lobed, c. 1.5 mm long; style c. 4 mm long. Fruits

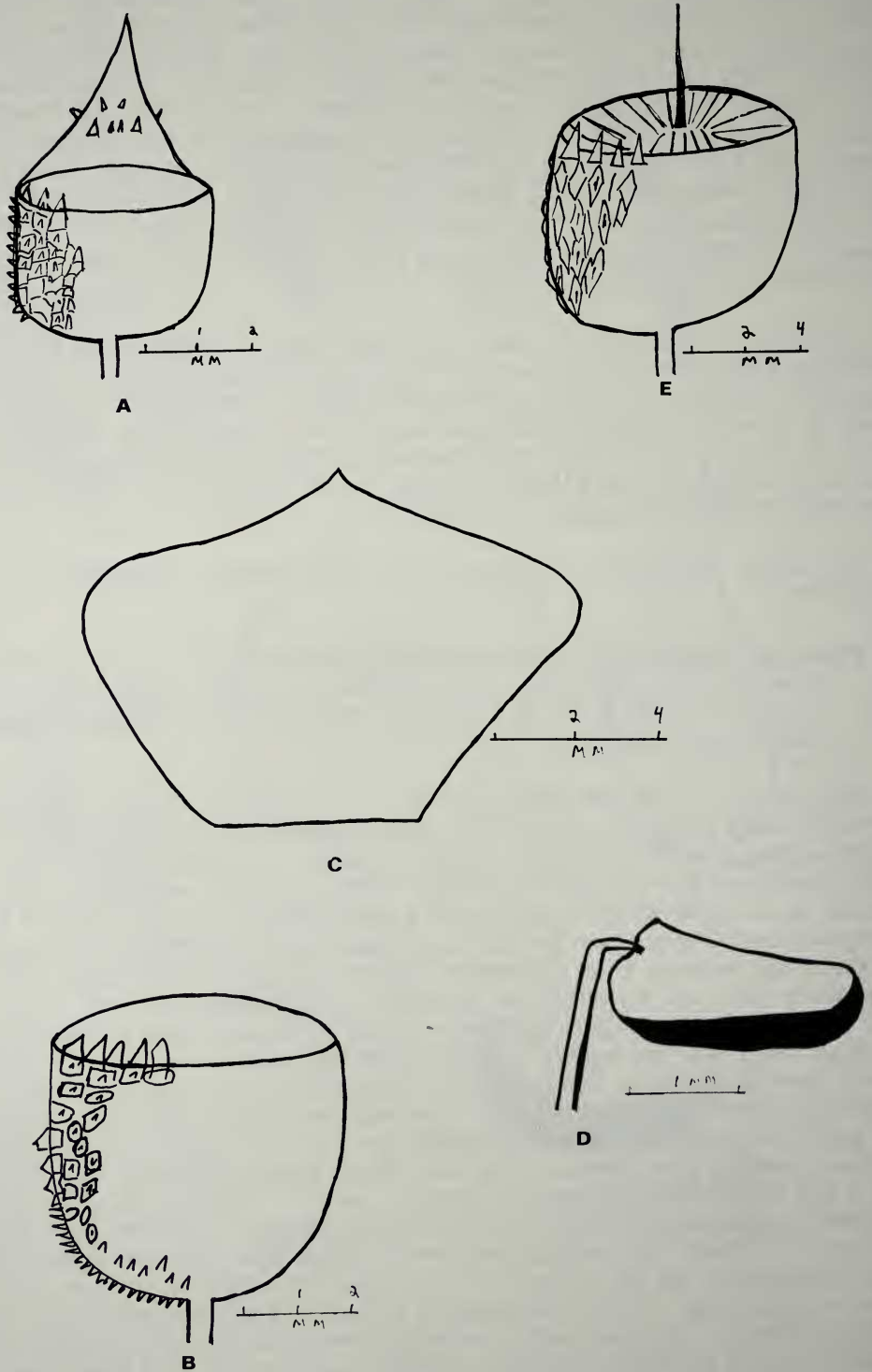


Fig. 16. *Pternandra tessellata* (Stapf) Nayar -- A-E: Haviland 1383 (isotype).

campanulate, truncate, scales flatter and more tessellate, triangular and erect near the margin, glabrous, areolus with conspicuous lines; style persisting, 8–9 mm long, 10–12 mm wide, green, drying dark brown to black; pericarp c. 1 mm thick, gritty. Seeds numerous, flattened, quadrangular-cuneate, glossy khaki-tan, c. 0.75 mm long.

Vegetatively, with its sinuate-winged branchlets and cordate blades, this species resembles *P. azurea* (Bl.) Burk. var. *cordata* (Korth.) Maxw., however there are differences which include the setose and often branched calyx scales of the latter. Immature buds of *P. tessellata* frequently resemble those of *P. rostrata* (Cogn.) Nayar when the tubercles on the cap are not apparent. The rostrate tip and calyx scales are also similar.

The calyx scales of *P. tessellata* also resemble those of *P. tuberculata* (Korth.) Nayar, however the cap in that species is without any trace of tubercles. Unfortunately, flowering material of *P. tessellata* is sparse, thus I cannot be certain of the morphology of the mature internal flower parts. Stapf notes that his species is close to *Kibessia simplex* Korth. (= *P. echinata* Jack) and to Curtis 953 from Penang which is a syntype of *P. griffithii* King (= *P. tuberculata*). *P. tessellata* differs in many significant ways from *P. echinata* Jack, e.g. the length of the scales, winged branchlets, shape and pubescence of the leaves, etc.

P. tessellata appears to be a distinct species without any intermediate forms linking it to other species. More material, especially flowers, is required to better understand the species.

Stapf lists the type collection as being Haviland 1303 from Koung, Tampassuk River, Mt. Kinabalu, Sabah; however I believe that the actual number is 1383 since specimens of this species in the Singapore, Leiden, and Kew collections collected by Haviland at this locality in 1892 are labeled as *K. tessellata* Stapf. I have not seen Haviland 1303 in any collections of Melastomataceae that I have studied.

Fig. 16. A, B: calyx; C: bud petal; D: stamen; E: fruit.

Distribution:

Borneo Sabah – Bukit Tibang: Anderson & Paie 28628; Long Bah: Brooke 9037; Mt. Kinabalu: Clemens 26798, 26906, 30349; Gibbs 3969; Haviland 1383 (holotype K, isotypes L, SING). Quoin Hill, Tawau: Brand 24547; Tambato, Tambunan: Puasa-Angian 3988; Tambunan Hill: Alphonso 57.

Kalimantan – Central East, W. Koetai: Endert 2961, 4561.

16. *Pternandra teysmanniana* (Cogn.) Nayar, Bull. Bot. Survey India 17 (1978) 53. *Kibessia teysmanniana* Cogn. in DC., Monogr. Phan. 7 (1891) 1109; Merrill, J. Str. Br. Roy. As. Soc. 86 (1921) 451; Bakhuizen f., "Thesis" (1943) 323 (name), Med. Mus. Bot. Utrecht 91 (1943) 323 (name), Rec. Trav. Bot. Neerl. 40 (1943–45) 323 (name). *Kibessia pachyphyllum* Bakh. f., l.c. (1943, 1943–45) 318, *syn. nov.* *Pternandra pachyphylla* (Bakh. f.) Nayar, l.c. 52, *syn. nov.*

Tree (other field notes lacking). Branchlets cylindrical, glabrous, 1.5 mm thick, drying blackish; upper nodes flattened, c. 3 mm thick. Blades coriaceous, glabrous, elliptic, ovate, to obovate, rounded at the tip, narrowed to rounded at the base; 3-nerved, veins sunken above, raised and tapering below; intramarginal nerves invisible; secondary venation pinnate, reticulate, distinct above, invisible to obscure below; 3–5 cm long, 1.5–3

cm wide, drying greenish to brown above, tan to lighter brown below. Petioles 1.5–2.5 mm long, 1.5–2 mm thick, glabrous. Inflorescences glomerulate, on tubercles from leaf axils or just below them, many-flowered, glabrous; primary axes usually several per axil, c. 1 mm long, each with a solitary pedicel 1–2 mm long. Bracts and bracteoles ovate, acute, 0.5–1 mm long, glabrous. Calyx campanulate, glabrous, pattern closely tuberculate in the lower part, with larger and longer tubercles near the margin; 3–4 mm long, 2.5–3 mm wide; cap conical, acute, glabrous, smooth, thin, c. 2.5 mm long, splitting into several (4?) caducous lobes. Petals broadly ovate, acute at the tip, narrowed and truncate at the base, thickened with thinner margins where the venation is visible, 3–5 mm long, 2–2.5 mm wide. Filaments flattened, 2 mm long; anthers 2–2.5 mm long, 1 mm wide, with a connective spur near the filament; stigma cylindrical, 1 mm long. Style slender, 3–4 mm long, elongating to 6 mm in fruit. Fruits urceolate, 5 mm long, 5 mm wide, pattern tessellate to slightly umbonate, exocarp drying brown; pericarp c. 0.2 mm thick. Seeds numerous, flattened, cuneate-quadrangular, 1–1.25 mm long, glossy brown.

The relatively small (the smallest for the genus), thick, blades with a rounded tip; fascicled inflorescences, small flowers, and urceolate fruits with a tessellate pattern distinguish this apparently rare species from all others.

The inflorescences and fruits are similar to those of *P. galeata* (Korth.) Ridl. and *P. cogniauxii* Nayar, however the former has a tessellate pattern on the calyx and the latter is easily recognized by its large, cordate, 5-nerved blades. *Pternandra teysmanniana* is not, as Bakhuizen f. notes under *Kibessia pachyphyllum*, related to *kibessia acuminata* Decne., which is, in my opinion, related to *Pternandra echinata* Jack. The calyx pattern of *K. acuminata* is more tuberculate to echinate and is probably an underdeveloped form of *P. echinata* where the scales are flattened-echinate.

Kibessia pachyphyllum Bakh. f., only known from the type collection, is undoubtedly identical to *P. teysmanniana*. The holotype of the former (Hallier 2223, from Kalimantan) is without inflorescences or fruits, however comparison of its leaves and buds with those of two collections of *P. teysmanniana* confirms its synonymy. Bakhuizen f. did not describe *K. teysmanniana* in his monograph. Nayar's recombination of *K. pachyphyllum* Bakh. f. to *Pternandra* was done without having examined any relevant material, thus indicating his failure to contribute to or understand the taxonomy of *Pternandra*.

Fig. 17: A: inflorescence; B, C: calyx; D: mature petal; E: stamen.

Plate 6. Holotype of *Pternandra teysmanniana* (Cogn.) Nayar.

Distribution:

Borneo *Kalimantan* — Mdjang: Teysmann 8165 (holotype FI, isotype BR); Sei Kenepai Singang: Hallier 2223 (*Kibessia pachyphylla* Bakh. f., holotype L, isotype BO); Soengai Djemila: Hallier 2247; exact location unknown: Jaheri 1893.

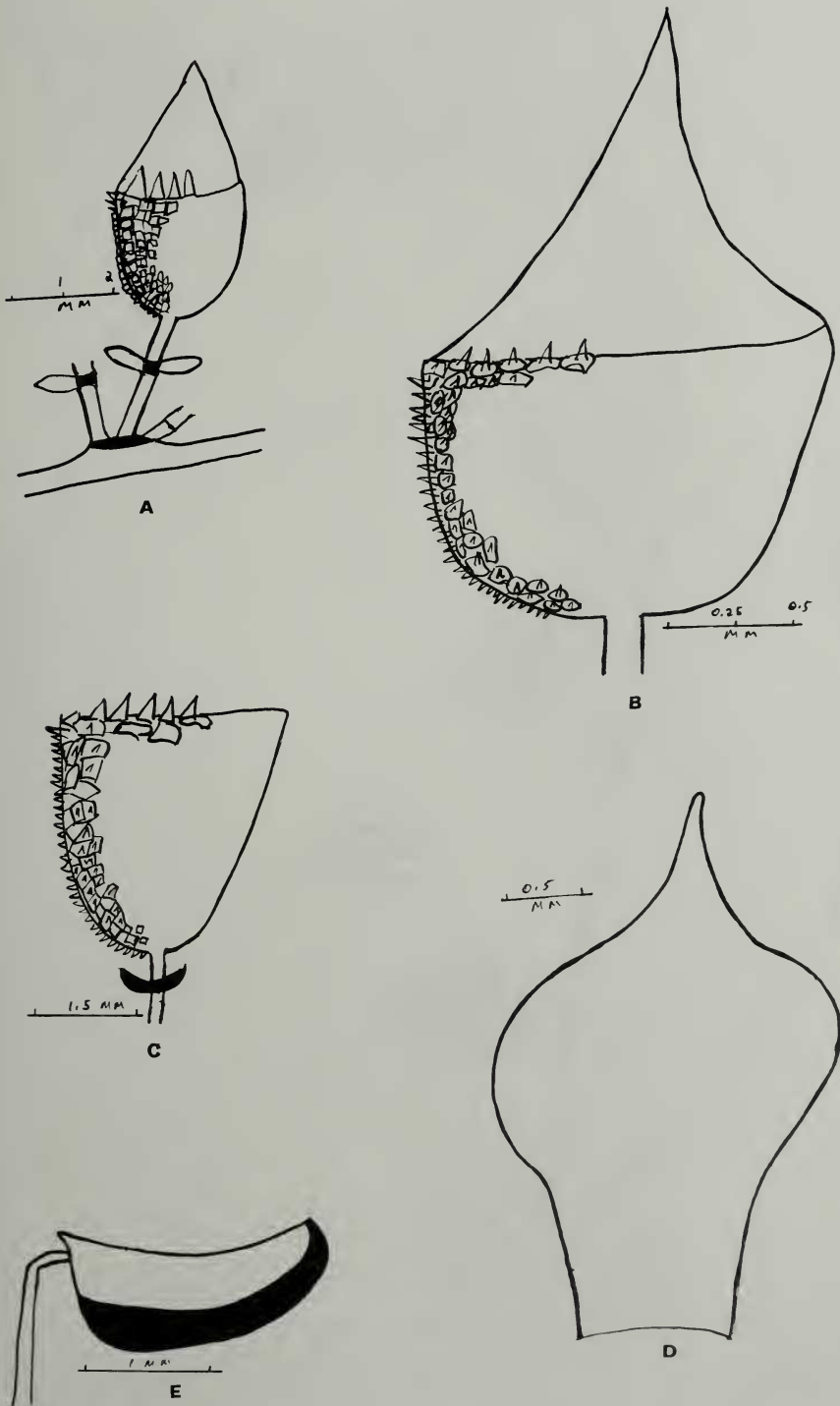


Fig. 17. *Pternandra teysmanniana* (Cogn.) Nayar - - A, D, E: Teysmann 8165 (holotype); B, C: Hallier 2223 (*Kibessia pachyphyllum* Bakh. f., holotype).

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R.H. film 16 neg. 7.



1879/7/006

Holo Lecto
Herb. Swin.

TYPE

K. P. ...
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No. 9115. *Willebr.*

Commun. ex. Herb. Hort. Bot. Bag.

Pternandra teysmanniana Cogn.
Pternandra teysmanniana Cogn.
et Cogn.

Archipel. Ind.

Borneo. *P. teysmanniana*

Leg. Teymann

ERBARIUM
No. 4050

Plate 6. *Pternandra teysmanniana* (Cogn.) Nayar, holotype at Florence. Collected by and named after J. E. Teysmann (1808-1882), a Dutch botanist who collected extensively in the Malay Archipelago. This specimen is from Borneo and was collected in 1876. Photo: Rijksherbarium, Leiden.

17. *Pternandra tuberculata* (Korth.) Nayar, Bull. Bot. Surv. India 17 (1978) 53; Keng, Gard. Bull. Sing. 31 (1978) 110 (*P. tuberculata* (Korth.) Maxw.). *Ewyckia tuberculata* Korth. In Temm., Verh. Nat. Gesch. (1844) Bot. 255. *Rectomitra tuberculata* (Korth.) Bl., Mus. Bot. Lugd.-Bat. I:1 (1849) 7. *Kibessia tuberculata* (Korth.) Hk. f. ex Cl in Hk. f., Fl. Brit. India II (1879) 553; Cogniaux in DC., Monogr. Phan. 7 (1891) 1110; Koorders-Schumacher, Syst. Verz. 2 (1910) 47; Bakhuizen f., "Thesis" (1943) 322, Med. Mus. Bot. Utrecht 91 (1943) 322, Rec. Trav. Bot. Neerl. 40 (1943-45) 322. *Pternandra griffithii* King, J. As. Soc. Bengal 69, II:1 (1900) 70 (Mat. Fl. Mal. Pen. 3, 478), *syn. nov.*; *Pternandra griffithii* King var. *cordata* King, l.c. 71 (l.c. 479), *syn. nov.* *Pternandra paniculata* Benth. ex Ridl., Fl. Mal. Pen. I (1922) 809 (including *P. griffithii* King). *Ewyckia korthalsiana* Miq., Fl. Ned. Ind. Suppl. I, Sumatra (1860) 124 (*nomen*), 321. *Pternandra korthalsiana* (Miq.) Triana, Trans. Linn. Soc. 28 (1871) 153, *syn. nov.*

Tree up to 20 m tall with a maximum diameter of 50 cm. Bole straight, not buttressed; outer bark 0.5 mm thick, grey to brown with many shallow fissures, smooth and peeling off; inner bark white, wood yellowish. Branchlets terete, smooth, glabrous, drying blackish, c. 2 mm thick, nodes flattened and swollen, c. 4 mm wide. Blades subcoriaceous to coriaceous, glabrous, broadly lanceolate to broadly ovate, acuminate at the tip (acumen 6-10 mm long), narrowed and decurrent or rounded to cordate at the base; 3-nerved from the base, nerves sunken above, raised and tapering below; secondary venation pinnate, c. 15-20 pairs, reticulate; 5.5-12 (19) cm long, 3-6 (9.5) cm wide, dark green above, green below; drying olive to blackish above, tan to dark brown below. Petioles 4-5 mm long, 1-2 mm wide, glabrous. Inflorescences cymose, from leaf axils, less commonly leafless nodes, often terminal, 1-2.5 cm long, several to many flowers per axil; axes 4-angled, puberulous. Bracts and bracteoles lanceolate to ovate, obtuse to acute at the tip, 2-3 (5) mm long, larger ones concave, minutely puberulous. Primary axes 1 to several per axil, 4-20 mm long, with 1-3 nodes, up to 1 mm thick; secondary axes 2-4 mm long, pedicels 2-3 mm long. Calyx campanulate, 4-5 mm long, c. 4 mm wide, green, covered with minutely puberulous, often appressed, tubercles which are shorter near the pedicel and longest (c. 2 mm) near the rim; cap mammiform, papillose-puberulous, smooth, c. 2 mm long, splitting into 4 triangular lobes. Bud petals imbricating to the right, when mature thickened, broadly ovate to suborbicular, acute at the tip, truncate at the base, 4-5 mm long, 4-5 mm wide, lilac. Filaments flattened, c. 2 mm long, lilac; anthers c. 2 mm long, yellow. Stigma 4-lobed, c. 2 mm long, yellow. Style slender, glabrous, 4-5 mm long, whitish. Fruits campanulate, truncate at the margin, 7-8 mm long, 7-8 mm wide, pattern umbonate-verruculose; exocarp grey-green, drying black. Seeds numerous, flattened, cuneate-quadrangular, c. 0.5 mm long; testa glossy tan.

The type collection of *P. tuberculata* (Korthals s.n., from Sumatra) has some inflorescences and young buds. From the descriptions of this species it is apparent that it has a calyx cap which splits into 4-lobes. The leaves of the type material match those on Griffith 2272/1 - which is the lectotype of *P. griffithii*. This specimen and the syntype collection (Curtis 953) have buds and mature flowers. The nature of the calyx cap and inflorescence is different from those of *P. rostrata* which has shorter, thicker, and glabrous flowering axes; an acute to rostrate cap which falls off in one piece; and generally larger blades. This last point has many exceptions, e.g. Koster 1481, from New Guinea, has leaves larger than the type collection of *P. rostrata* (Beccari 979); and Meijer 37999 (*P. rostrata*) which has leaves smaller than Griffith 2272/1. I have not been able to separate the two species on the basis of vegetative characters since the leaves vary considerably for each.

The type collections of *P. griffithii* are probably the same as *P. tuberculata*. I have attempted to construct an idea of *P. tuberculata* using *P. griffithii* as a basis. Cogniaux and Bakhuizen f. adopted this approach and considered *P. griffithii* King as a synonym, however Ridley combined *P. griffithii* with *P. paniculata* Benth. ex Cl. which is based on a specimen with an abnormal, witches broom inflorescences. I agree with King and Bakhuizen f. in considering *P. paniculata* Benth. ex Cl. as a synonym of *P. coerulescens* Jack. Another possibility is that the two species are different and that *P. coriacea* (Cogn.) Nayar is the same as *P. tuberculata*. The basic problem lies in trying to determine what the nature of *P. tuberculata* really is.

The blades of the type collection of *P. tuberculata* closely resemble those of Beccari 3164 and 3324 — both types of *P. coriacea*. The leaves on these collections are always small, in contrast to those of *P. griffithii* which often become rather large. The basic structure of the inflorescences of *P. tuberculata*, *P. griffithii*, and *P. coriacea* are similar and the only distinction I can find between the taxa lies with the calyx cap which falls off as a unit in *P. coriacea*. It is due to the nature of the cap plus its small leaves that I have followed Cogniaux in considering *P. coriacea* distinct from *P. tuberculata*. Both species are uncommon and more flowering and fruiting material are needed to fully understand these taxa.

The holotype of *Ewyckia korthalsiana* Miq. at Utrecht (Teysmann sn, from Bangka Island) is without flowers or fruits, however there are two short parts of two inflorescences remaining. *E. korthalsiana* is written on the original label and on another more recent tag *P. capitellata* Jack is noted. The primary axes on this specimen are between 8 and 10 mm long, thus they are longer than the maximum (3 mm) generally considered for *P. capitellata*. Bakhuizen f., therefore, included *E. korthalsiana* under *P. coerulescens* Jack var. *cyanea* (Bl.) Bakh. f. Cogniaux, however, included it under *P. capitellata*. Since the specimen lacks flowers and fruits I cannot be absolutely certain that it is *P. coerulescens*.

The blades and remnants of the two inflorescences on this specimen, in my opinion, more closely resemble Griffith 2272/1 — which is the lectotype of *P. griffithii* King. The shape, texture, and colour of the dry leaves match, and the inflorescence axes are more like those of *P. griffithii* than of *P. coerulescens*. Miquel's original description indicates that the calyx is "obtusio-4-dentatus, areolato-verrucellosus". This is not a feature of *P. coerulescens* which has a truncate calyx with a tessellate or somewhat umbonate pattern. Teysmann's specimen, from its general appearance, more closely resembles several other collections of *P. tuberculata* than *P. coerulescens* which tends to dry black.

Wray 1994, lectotype of *Pternandra griffithii* var. *cordata*, has slightly cordate blades. However, this feature is only developed on some blades and in others the indentation is more like that of an auricle. Most specimens of *P. tuberculata* in the Singapore and Leiden collections have acute bases, but some of the blades in Robinson & Kloss 6148 are rounded, and in fact look like some of the blades in Wray 1994. The texture of the blades in Wray 1994 is very similar to many specimens of *P. tuberculata* (Ridly s.n. from Bodi Tepah, Nov. 1908 — which has rounded blades, and Nauen 35879). Some of the blades in these specimens are broadly rounded and some appear to be almost cordate. The distinction of var. *cordata*, in my opinion, does not merit a separate taxon, therefore I have united it with *P. tuberculata*.

Maxwell 77-22, from Singapore, differs from all other flowering specimens of *P. tuberculata* that I have seen in having a thin, mammiform cap which falls off in one piece. The collection in all other respects matches other collections of *P. tuberculata*.

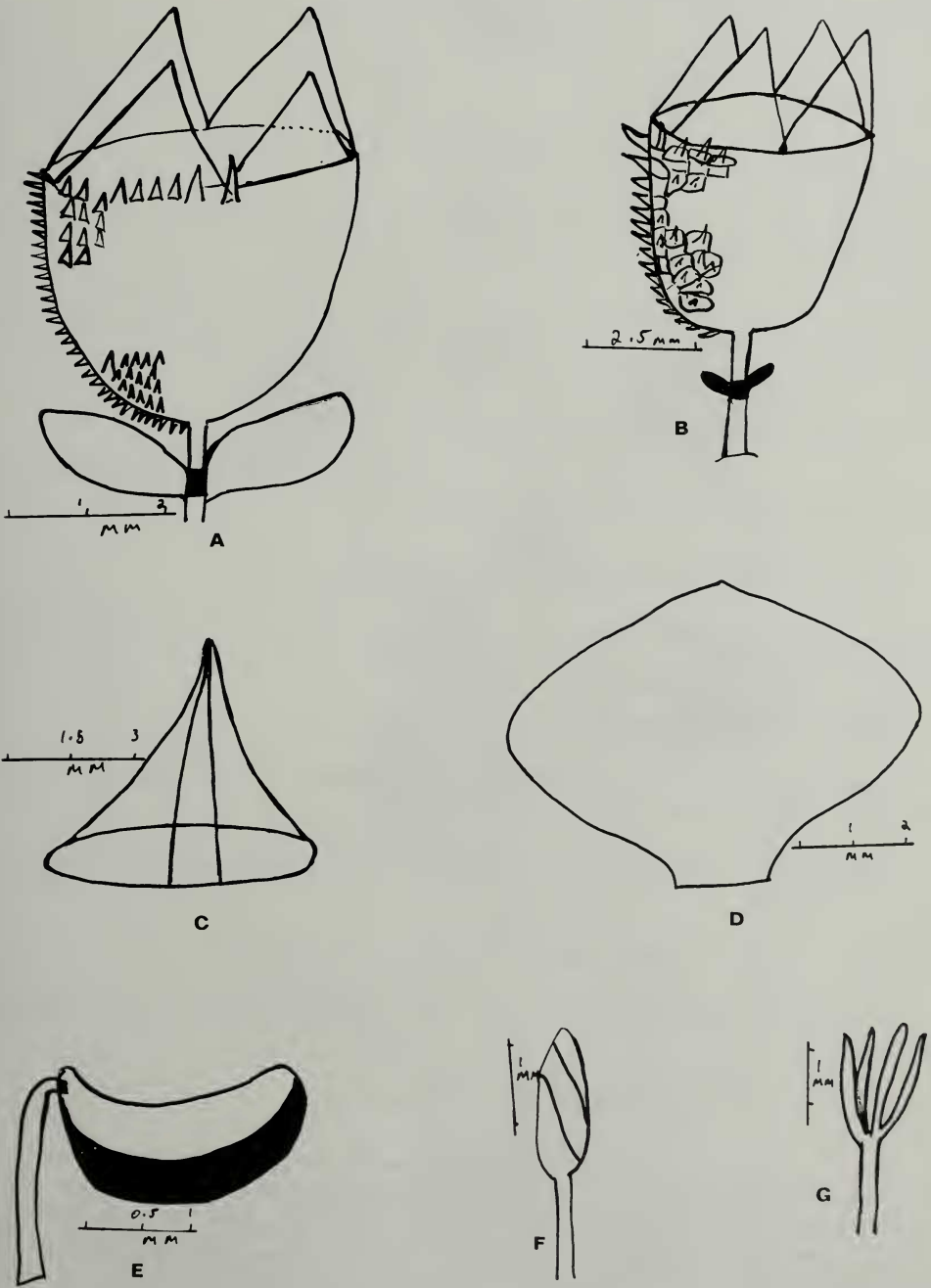


Fig. 18. *Pternandra tuberculata* (Korth.) Nayar - - A, G: Buwalda 6239; B, E: Griffith 2272/1 (*Pternandra griffithii* King, lectotype); C, D: Maxwell 77-22; F: Koster 1481.

Fig. 18. A, B: calyx; C: calyptra; D: petal; E: stamen; F: style in bud; G: mature style.

Plate 7. Holotype of *Pternandra tuberculata* (Korth.) Nayar.

Plate 8. Lectotype of *Pternandra griffithii* King.

Distribution:

W. Malaysia. Kedah — Serdang: Nauen 35879; sine loc.: Meh 17863.

Penang — Curtis 453 (syntype *P. griffithii* King var. *cordata* King, not seen), 953 (syntype *P. griffithii* King), 2784, 2786, sn in June 1890.

Perak — Bidoi Tapah: Ridley sn in Nov. 1908; Larut: Wray 1994 (*P. griffithii* King var. *cordata* King, lectotype SING); Pondok Tanjong For. Res.: For. Dept't. Fed. Mal. States 1147; Taiping: Ridly 14685 (abnormal).

Trengganu — Ulu Brang: Moysey & Kiah 33646 (abnormal).

Selangor — Batu Tigai: Ridley 11936; Genting Highlands Rd., 9th mile: Kochummen 023063; Semangkok Forest Reserve: Chan 13270.

Malacca — sine loc.: Griffith 2272/1 (*P. griffithii* King, lectotype K).

Singapore — Ahmad 1054, 1365; Anderson 63, Maxwell 77-22; Ridley 3918, 4729.

Riouw Archipelago. Bukit Tanjong: Buwalda 6239.

Sumatra. West Coast — Gunong Koerintgi: Korthals sn (*Ewyckia tuberculata* Korth., holotype L); Kuala Belilas: Buwalda 6693.

Bangka Island — Soengailiat: Teysmann sn (*Ewyckia korthalsiana* Miq., holotype U, isotypes (?) U, BO).

Borneo Sabah — Sosopodon: Mikil 38499.

New Guinea Iloilo: Streimann & Kairo 26184; Japen Island: Koster 11178; Kaloal: Koster 1481.

18. ABNORMAL AND UNIDENTIFIED *PTERNANDRA*.

There are several collections of *Pternandra* in the Singapore and Leiden herbaria that have abnormal inflorescences with witches broom deformities or are vegetative (Plate 2). With many of these specimens I am reasonably certain as to their identities (indicated by aff.) however with others I cannot be absolutely certain what species they are. Since the vegetative characteristics of *P. echinata* Jack and *P. azurea* (Bl.) Burk. are often similar I have, in most instances, been able to sort these specimens on the basis of collecting locale, that is *P. echinata* is mostly restricted to the Malay Peninsula and *P. azurea* to the Malay Islands. A more difficult problem lies with abnormal or vegetative collections of what closely resembles *P. coerulescens* Jack and *P. tuberculata* (Korth.) Nay. from the Malay Peninsula, and these two species plus *P. galeata* (Korth.) Ridl. and *P. rostrata* (Cogn.) Nay. from the Malay Islands. The branchlets and leaves of these four species

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R.H. film 16 neg. 8 .



TYPE!

Ewyckia tuberculata Korth.

Kibessia tuberculata (Korth.) Nayar
f. ex C1

Det. R. C. Bakhuizen Utrecht 1972
v. d'Brink fil



102210

Herb. Lugd. Batav.

Piernandra tuberculata

Piernandra tuberculata

Plate 7. Holotype of *Piernandra tuberculata* (Korth.) Nayar at Leiden. This species was originally described by Korthals in 1844 as *Ewyckia tuberculata* Korth. and was recombined by Blume as *Rectomitra tuberculata* (Korth.) Bl. in 1849. It was changed to *Kibessia tuberculata* (Korth.) Hk. f. ex C1. in 1879 and finally to *P. tuberculata* (Korth.) Nayar in 1978. Photo: Rijksherbarium, Leiden.



Plate 8. Lectotype of *Pternandra griffithii* King at Kew which has been reduced to a synonym of *P. tuberculata* (Korth.) Nayar in this revision. *Pternandra griffithii* King, from Malacca, was named by King in 1900 in honour of William Griffith (1810-1845), a British surgeon-botanist, who collected extensively and published detailed accounts of the flora of British India and the Malay Peninsula. Photo: Rijksherbarium, Leiden.

often resemble each other, therefore without flowers or fruits I have not ventured to guess what species these specimens are. Hopefully collectors will take notice of abnormal *Pternandra* inflorescences and make an effort to collect normal specimens from the same tree so that future workers can study the degree and variability of such deformities which can be positively identified.

In several specimens, e.g. Ridley 391 (8?); Ridley sn, from Bidoi Tapah, Perak in November 1908; Nauen 35879; and Moysey & Kiah 33646; the inflorescences are abnormal in that they are 8–15 cm long, with a few rudimentary leaves and enlarged, lanceolate, acuminate bracts which often resemble the leaves; and with or without a few, often deformed, flowers. These specimens, in my opinion, are *P. tuberculata* (Korth.) Nay. since what I can see of the calyx resembles this species more than that of *P. coerulescens* Jack.

Ridley was of the opinion that *P. paniculata* (Miq.) Triana is a panicled form of *P. griffithii* King where the inflorescence is "abnormal or converted into a mass of small leaves, with a few abnormal flowers intermixed." Bakhuizen f. considered *P. paniculata* as a synonym of the typical variety of *P. coerulescens* Jack. Moreover, he notes that *P. paniculata* is based on a specimen with a witches broom deformity of the inflorescence. Apparently this abnormal condition affects both *P. coerulescens* and *P. tuberculata*, however it is extremely difficult to tell the species apart without normal flowers or fruits.

The calyx tube in some specimens, e.g. Kostermans 13664 (Borneo) and others with this abnormal inflorescence, is tuberculate with a distinct and smooth cap. These specimens are most likely *P. rostrata* or *P. tuberculata*.

Other specimens, e.g. Teysmann sn, from Bangka Island — the holotype of *P. (Ewyckia) paniculata* (Miq.) Triana; Winkler 2408, Haviland =177 (both from Borneo) and others have a tessellate calyx and no cap. These collections are clearly *P. coerulescens* Jack.

Kibessia simplex Korth. var. *oblonga* Bl. (Mus. Bot. Lugd.-Bat. I:1 (1849) 9) is described from a specimen (Waitz sn, from Borneo) which has an abnormal inflorescence which resembles those of *P. azurea* and *P. coerulescens*. Unfortunately, the specimen lacks buds, thus I cannot be absolutely certain of what species it really is; however from the leaves and branches var. *oblonga* more closely resembles the type collections of *P. azurea* (Bl.) Burk. and *Kibessia simplex* Korth. — which I consider a synonym of the former. I do not agree with Bakhuizen f. in reducing var. *oblonga* to a synonym of *P. coerulescens* Jack.

Craib (F1. Siam. Enum. I:4 (1931) 702) notes that several collections of *P. coerulescens* Jack from southern Thailand have abnormal inflorescences. He also indicates that several species of *Diospyros* (Ebenaceae) and *Maesa* (Myrsinaceae) are also affected in this manner.

Specimens Examined

W. Malaysia *Kedah* — Kedah Peak: Robinson & Kloss 6148.

Penang — I. H. Burkill 6145 (aff. 5).

Perak — Ayer Larut: Wray sn; Dindings: H. M. Burkill & Shah 185 (aff. 5); Pangkor: Ridley sn; sine, loc.: Scortechini 248, sn.

Singapore – Murton 92 (aff. 8), Ridley sn at Chan Chu Kang.

Sumatra. Bangka Island: Kostermans & Anta 85.

Borneo. Sarawak – Bukit Lambir, Baram District: Chew 961; Segan For. Res.: Wright 27105; Sungei Lebang, Bintulu: Ashton 16299.

New Guinea. Warsamon Valley, Sorong: Moll 11601, 11670 (aff. 9, 17).

Sine Loc.: Boerlage 6688 (aff. 2).

APPENDIX

1. *Kibessia* ? *angustifolia* Bl., Mus. Bot. Lugd.-Bat. I, 1 (1849) 9. This is probably *P. echinata* Jack.
2. *Pternandra discolor* Cogn. in DC., Monogr. Phan. 7 (1891) 1194. An isotype at Brussels, Balansa 1145, from Tonkin, is *Rhodamnia dumetorum* (DC.) Merr. & Perry, of the Myrtaceae.
3. *Pternandra* ? *cordifolia* Cogn., l.c. 1105. An isotype at Leiden and the holotype at Brussels, Beccari 570 from Sarawak, consist of leaves of *Medinilla muricata* Bl.
4. *Kibessia galeata* var. *latifolia* Ohwi, Bot. Mag. Tokyo 57 (1943) 18. The type (Kanehira & Hatusima 13146, New Guinea) has not been seen.
5. *Pternandra moluccana* Nayar, Bull. Bot. Surv. India 17 (1978) 53. The holotype at Leiden (Pleyte 253 from Halmaheira) is *Medinilla* sp.
6. *Pternandra parasitica* Finl. & Wall. (Wall. cat. 4086A) is *Pogonanthera pulverulenta* (Jack) Bl.
7. *Kibessia celebica* Koord., Fl. van Celebes II (1898) 466 is *Medinilla myrtiformis* (Naud.) Triana.
8. *Pternandra simplex* (Korth.) Baill., Hist. Pl. 7 (1880) 24, f. 32, 33. The two figures cited do not represent this species (the correct name of which is *Pternandra azurea* var. *azurea*) and it is most likely that they were based on *P. rostrata* (Cogn.) Nayar or perhaps *P. tessellata* (Stapf) Nayar.
9. *Pternandra ledermannii* (Mansf.) Nayar, Bull. Bot. Survey India 17 (1978) 53. *Kibessia ledermannii* Mansf. in Engler, Bot. Jahr. 60 (1925) 138.

This species, from New Guinea, supposedly differs from *P. coriacea* (Cogn.) Nayar in having larger leaves, shorter pedicels; and smaller, flatter calyx tubercles. *P. coriacea* also has glaucous blade undersurfaces which dry whitish to greyish, and are more ovate and less lanceolate-elliptic than those of *P. ledermannii*. The tubercles in *P. coriacea* are more acute and in *P. ledermannii* more flattened and hexagonal.

I believe that *P. ledermannii* is closer to *P. rostrata* (Cogn.) Nayar, however I cannot be certain of this until more New Guinea material becomes available. Mansfield lists Ledermann 8717a, which I have examined at Singapore, as possibly being equal to the

holotype: Ledermann 8711 — which I have not seen. The collection at Singapore consists of a few flowering axes and one flower bud. The calyx pattern and the thickened, acuminate cap, which apparently falls off in one piece, resemble *P. rostrata* more than any other taxon. It is definitely not *P. tuberculata* (Korth.) Nayar or *P. glaeata* (Korth.) Ridl. var. *galeata* both of which have caps have caps that split into four lobes.

Nayar, without having examined any authentic material of *Kibessia ledermannii* Mansf., merely transferred this species to *Pternandra* without any discussion. Needless to say, such pseudo-academic pursuits, however beneficial to their author, merely create more unnecessary confusion and certainly detract from one's taxonomic credibility — and in the case of Nayar, an already dubious one.

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